MARINE REVIEW

WITH WHICH IS CONSOLIDATED
THE MARINE RECORD.

[WEEKLY.
[ESTABLISHED, 1878.

Vol. XXIX

Eastern Office,
1023 Maritime Bldg., New York City.
Chicago Office, 373 Dearborn St.

CLEVELAND, O., JAN. 28, 1904.
Published every Thursday at 39-41 Wade Bldg.
by the Marine Review Pub. Co.
[Entered at Cleveland Post Office as second-class matter.]

Subscription $3.00 year.
Foreign $4.50 year.
Single Copy 10 cents.

No. 4

GOVERNMENT DREDGES ON THE LAKES.

As though there were not worries enough in the ordinary course of business, the government seems to be making it unusually irksome for those engaged in dredging operations. At the annual meeting of the Great Lakes Tug & Dredge Owners' Protective association, held in Chicago last week, committees were appointed to go to Washington and endeavor to ascertain the precise attitude of the war department towards the expenditure of appropriations for river and harbor work. It is claimed that while $6,000,000 is available for work along the great lakes, a number of the projects are being held up and it is impossible to secure any satisfaction from the authorities when inquiries are made concerning the matter. Ever since the government started into the dredging business on the lakes the private dredging interests have obtained scant courtesy.

The building of these dredges must be looked upon as a part of the general scheme of the army engineers to perpetuate themselves in office. The corps of engineers, of course, had a real excuse for their existence during the civil war; but since then they have been manufacturing excuses. They are not slow, before the general schemes of improvement in rivers and harbors are nearing completion, to lay down the lines for new projects. Their plan and purpose has been one of gradual encroachment upon legitimate private enterprise at the expense of the general public. Little by little they have advanced until the amount of work which they are now doing that should be done by private enterprise is enormous—and it is costly as well, but cost is one of the things that never worries the government engineer. The work begun by these engineers has only to be indefinitely extended to make the government of the United States entirely paternal and its citizens a race of spineless dependents.

The act authorizing the building of a dredge for Lake Erie harbors was entirely optional in its character. It authorized the secretary of war to build the dredge out of funds appropriated for the improvement of the harbors but it did not require him to do so. The act was not, in any sense, mandatory and it specifically used the word "may." When the dredging interests first saw the secretary of war on the subject they were of the understanding that he was not in favor of the general principle of public dredging and that if an optional construction could be placed upon the act the dredge should not be built. Imagine, therefore, their surprise a little later when the act was declared to be mandatory and that on top of this, without warrant whatever, a dredge was ordered built for Lake Michigan without specific appropriation. The money was diverted from funds appropriated for the improvement of Lake Michigan harbors without further congressional sanction. The act for Lake Erie authorizes the secretary to divert money from harbor improvement funds, but there is no such act, as far as can be learned, for Lake Michigan.

With every sound argument in opposition to the building of government dredges there must have been some powerful and hidden interest working in the opposite direction; and there is reason to believe that this influence was exerted largely by Senator Hanna. It is not creditable to the senator that he should oppress one branch of the lake trade out of which he has made a great fortune that other branches may thrive a little more. But it is true that those who sought him for relief could get none but were flatly told that the dredges would be built. Why, above all others, should Senator Hanna favor paternalism in any degree whatever. His whole private interests are otherwise invested and his personal energies otherwise directed. It is quite clear that he would violently oppose municipal ownership of street railways, and yet he favors government ownership of dredges, which is precisely the same thing. He would be the first to see the injustice of the government digging in his coal mines. Why should he be the last to see the injustice of the government digging in the rivers? And yet there would be more warrant in the government mining coal than in dredging harbors, for the government spends more money for coal in a day than it does for dredging in a twelvemonth. Senator Hanna's attitude in this matter, in view of the broad views in business matters with which he is generally credited, is difficult to understand.

The injustice of the public dredge is absolutely manifest. It is unjust to private interest and to the public in general, for in the first place it robs the individual business man of what rightfully belongs to him and in the second place it puts an excess tax upon the ratepayer. It is idle to say that the government does work as cheaply as the private individual. It doesn't have to do it as cheaply and consequently it does not do it as cheaply. It is nonsense to suppose that a person with unlimited capital is going to live as cheaply as one whose capital is decidedly limited. When no allowance is made for interest, for depreciation and for replacement it is a very simple matter to figure out a very low rate per cubic yard for dredging. Nothing can so conveniently lie as figures while bearing the plausible face of veracity.

The dredge owners at their annual meeting elected the following officers: President, W. A. Lydon; first vice-presidents, C. Weideman, E. T. Williams; second vice-presidents, R. J. Getz, W. C. Jones, Dennis McCarthy, H. T. Dunbar, John Breyman, H. W. Hubbell, J. R. Williams, Michael Sullivan, Harry Hickler, Robert Smith; secretary and treasurer, C. J. Connell; executive committee, J. A. Smith, P. B. McNaughton, S. O. Dixon, T. C. Lutz and Robert Smith.

CRAMPS GET BOTH BATTLESHIPS.

As foreshadowed in the last issue of the Review, contracts for the battleships Idaho and Mississippi have been given to Cramps of Philadelphia upon their bid of $2,999,500 each. The battleships are duplicates, are of the 13,000-ton class and are to attain a speed of 17 knots. Penalties are exacted for any reduction in this speed and if they fall below 16½ knots they may be rejected. The general dimensions and features of the vessels are as follows: Length of load water line, 375 ft.; breadth, extreme, at load water line, 77 ft.; displacement on trial, not more than 13,000 tons; mean draught to bottom of keel at trial displacement, 24 ft. 8 in.; mean gross draught, full load, about, 27 ft. 1½ in.; total coal bunker capacity, about, 1,750 tons; coal carried on trial, 600 tons; feed water carried on trial, 40 tons.

The main battery consists of four 12-in. breech-loading rifles, eight 8-in. breech-loading rifles, eight 7-in. breech-loading rifles and two 18-in. submerged torpedo tubes. The secondary battery consists of twelve 3-in., 14-pounder rapid-fire guns of 50 calibers in length; six 3-pounder semi-automatic guns; two 1-pounder semi-automatic guns; two 1-pounder rapid-fire guns; two 3-in. field pieces; two machine guns of .30 caliber, and six automatic guns of .30 caliber. The 12-in. guns will be mounted in pairs, in two electrically controlled, balanced, elliptical turrets, on the center line, one on the upper deck forward and one on the main deck aft. The 8-in. guns will be mounted in pairs, in four electrically-controlled turrets, two on each beam, at each end of the superstructure. The hull will be protected at the water line by a complete belt of armor, 9 ft. 3 in. wide and of a uniform thickness of 9 in. for about 244 ft. amidships, forward and aft of which the belt is reduced in width and the thickness is gradually decreased to 4 in. at the stem and stern.

The engines will be of the vertical, twin-screw, three-cylinder type of a combined horse power of 10,000. Each engine will be located in a separate watertight compartment and the screws will turn outboard from the top. There will be eight water-tube boilers, placed in four watertight compartments.

NO RIVER AND HARBOR BILL.

The house committee on rivers and harbors has finally made the formal announcement that there will be no river and harbor appropriation bill at the present session of congress. Mr. Burton, chairman of the committee, says:

"The main reason for this action was the very large balance appropriated for river and harbor improvements which is now lying in the treasury unexpended. This balance at the end of last year was somewhat in excess of $38,000,000. In addition to this, it is expected that $8,700,000 or thereabouts will be appropriated at this session in the sundry civil bill for the continuance of work on rivers and harbors where improvements are progressing under continuing contracts."

Speaking of the many complaints the committee had received regarding delay in prosecuting improvements already ordered, Chairman Burton assigned as the cause "the inadequate number of government engineers engaged in this branch of service, the delay and difficulty in preparing plans and securing sites for government works, and the high prices which have prevailed for several years past."

Mr. Burton says the committee will present a bill early next session. In the meantime legislation will be recommended for the necessary maintenance of existing public works, for such general legislation as may be desired and perhaps also for the examination and survey of new projects.

FAST CANADIAN ATLANTIC SERVICE.

An Ottawa dispatch says that the contract with Messrs. H. & A. Allan for an improved Atlantic mail service has at last been signed. The Allans agree to maintain a regular weekly service between Canada and Great Britain from the opening of navigation next spring until Aug. 1, 1906. One of the company's new turbine 17-knot vessels is to be ready in August next, and the other by the opening of navigation in 1905. The contractors will receive £2,000 for each round voyage between Liverpool and Quebec or between Liverpool and St. John run by each 17-knot steamer, £1,000 for each similar round voyage run by the Bavarian or Tunisian, and £500 for each round voyage by the Ionian, Sicilian or Pretorian between Liverpool and Quebec, and £750 for each round voyage by the latter vessels between Liverpool and St. John.

STORY OF MANY TRIALS.

Speed, Fuel Consumption, Horse Power, etc., of British Vessels of War—Thirty-two of them tried in 1903—Ships laid up on Account of "bad times"—Glasgow Letter.

Glasgow, Jan. 18.—With reference to what was said in the last letter of the speed trials of British warships, a word may now be said about the trials of coal consumption. The appended figures are interesting. The 1.45 lbs. recorded for the second trial of the Monmouth is a good result, but the Berwick has the best record. This need not be altogether due to the fact that she has the Niclausse boiler, because the Suffolk, also fitted with this steam generator, does not compare well with the Kent, Bedford or Monmouth, all of which have very good results:

COAL CONSUMPTION PER I. H. P. PER HOUR.

	First trial. Lbs.	Second trial. Lbs.	Full power. Lbs.
Bedford (Belleville)	1.91	1.97	2.12
Kent (Belleville)	1.81	1.83	1.89
Monmouth (Belleville)	1.83	1.45	1.97
Essex (Belleville)	2.03	2.17	2.22
Berwick (Niclausse)	1.75	1.78	1.91
Donegal (Belleville)	2.07	2.07	2.16
Lancaster (Belleville)	2.1	2.16	1.94
Cumberland (Belleville)	2.09	1.98	2.01
Suffolk (Niclausse)	1.89	1.89	2.2

One cruiser tried last year, the Euryalus, built and engined by the Vickers company, is the last of the Cressy class. Her delivery was delayed owing to a fire and an accident in one of the Mersey docks, but she has on her trials done very well, the designed speed of 21 knots being exceeded by 21.55 knots obtained. At 16,510 H. P. she steamed 20½ knots. The second-class cruiser Challenger was engined by the Wallsend company, and is interesting because she has the Babcock & Wilcox boilers. Her coal consumption results are very good, varying in the three trials from 1.74 to 1.78, and averaging 1.75 lbs. She attained her full speed of 21.09 knots with 12,781 H. P., while 19.24 knots was got with 8,972 I. H. P. The Fairfield company also passed through with three gunboats, which they had re-engined. These vessels had originally machinery of 3,500 I. H. P., which gave them a speed of 19½ knots, but with water-tube boilers and new engines fully two miles per hour have been added. The results of all three vessels have been remarkably uniform. The Leda developed 5,827 I. H. P. and steamed 21.843 knots, the Jason 5,863 I. H. P. and 21.931 knots, the Circe 5,821 I. H. P. and 21.624 knots. A sloop was also tried, namely, the Clio, which has Niclausse boilers, and at full power, 1,435 I. H. P., steamed 13.35 knots, the coal consumption being 2.03 lbs.

Of four battleships tried last year, the Cornwallis and Albemarle, both engined by the Thames Iron Works Co., belong to the Duncan class, of which all six have now been tried. Both have Belleville boilers, and the coal consumption on the respective trials averaged about 2 lbs. The Cornwallis, at full power, 18,201, steamed 18.984 knots over a measured distance, while the Albemarle for 100 more power steamed only 18.63 knots. At 13,600 H. P. the Albemarle had also less speed. The other two battleships were the Queen and the Prince of Wales, the former fitted with Babcock & Wilcox boilers and the latter with the Belleville type. The former gave better results so far as coal consumption was concerned.

There were nine new destroyers tried during the year—four of Laird's construction, three of Palmer's and two of Yarrow's. These vessels were to attain 25½ knots speed with about 7,000 I. H. P. and all of them exceeded this rate, the highest speed being by one of Yarrow's boats, 25.873 with 7,633 I. H. P. This vessel has also the credit of having consumed least fuel, 1.79 lbs. per indicated horse power per hour, while the sister ship from the same works, which steamed 25.468 knots for 7,827 I. H. P., had a coal consumption of only 1.99 lbs. In only three cases did the consumption exceed 2½ lbs. The coal consumption of Palmer's vessels varied between 2.11 and 2.33 lbs. The vessel which got the contract speed for least power was the Blackwater, built by Laird. For 6,939 I. H. P. she steamed 25.656 knots. The Velox, built at Elswick and fitted with Parson's turbines, made the tenth destroyer tried last year. She attained 27.124 knots, although the heating surface of her Yarrow boilers was 17½ per cent. less than in the case of the Yarrow destroyers of 25½ knots. Five 25-knot torpedo boats, built by Thornycroft, complete the list of thirty-two warships tried within the year, a number which compares with eighteen in 1902, thirty-two in 1901, and twenty-five in 1900.

BARGAINS IN CARGO STEAMERS.

Those who want bargains in cargo steamers may pick them up now from the fleet laid upon the Clyde on account of bad times. The earnings of cargo steamers have been far from good for some considerable time, and the year just closed has marked one of the dullest periods in the history of shipping. The depression is illustrated by the large amount of available tonnage at present lying idle in different parts of Scotland, but more particularly at Glasgow, Greenock, Leith and in the Gareloch. In all thirty-nine vessels of an aggregate tonnage of 70,968 (gross) are at present laid up.

UNSATISFACTORY STATE OF FRENCH SHIPPING.

A commission recently appointed to inquire into the condition of the merchant navy in France has made some alarming revelations. Economical conditions in France are not favorable to the formation of a numerous merchant fleet, because her export, such as silk or wine of high value, are not of great bulk. Many ships are not really needed, but the government, for military reasons, is anxious to possess a good seafaring population, and to this end ship building has to be assisted by the state. The system of bounties resorted to has had deplorable consequences. The country has been warned of grave dangers which threaten the maritime industries of France that call for prompt measures. In April, 1902, a law provided for a total tonnage of 600,000 for which bounties were to be granted. Money has been poured out to foster the mercantile marine, and ship builders and ship owners have hurried to earn the premiums, but nevertheless it is discovered the mercantile marine is rapidly shrinking with the prospect of the closing of ship yards and the dismissal of thousands of employes. The large sums allotted to pay state bounties and premiums have been rapidly absorbed, and ship builders and owners decline to build more ships unless the state guarantees them a certain sum of money. If additional huge sums are voted to continue the bounties the heavily-taxed ratepayers will rise in revolt. If the state ceases to encourage the trade no more ships will be ordered, and a wholesale closing of ship yards may be expected.

COMPETITION AMONG MAIL CARRIERS.

The competition among the American mail carriers is becoming keener each year. The latest development is the decision of the American Line to land mails and specie from New York at Plymouth, instead of at Southampton as previously. This new departure was inaugurated by the Philadelphia on her first trip of the year eastward. The contract for the conveying of the mails to London was given by the postmaster-general and the American Line to the Great Western Railway Co., which has all along worked the ocean traffic at Plymouth, and its boat special trains have achieved remarkable records for fast running. The primary object of the new arrangement is to secure the early delivery of the mails in London on Saturday mornings, so that letters will be delivered at their addresses in London four or five hours earlier than those arriving by the liners which make Queenstown or Southampton their port of call. The new arrangement came into operation on this side on Saturday, the 9th inst., when the steamer Philadelphia reached Plymouth with 20 tons of mails. Shortly before 5 a. m. the work of transferring them to the train in waiting was quickly accomplished. The train left the dock station at 7:30 and reached London at noon. By the altered method of transit it is claimed that mails will reach London at least three hours sooner than hitherto, and for the Midlands seven or eight hours' time should be saved.

NEW ANCHOR LINER FOR NEW YORK-MEDITERRANEAN TRADE.

The new Anchor liner Italia has sailed for Mediterranean ports. She is built for the trade between the Mediterranean and the United States, and she will take up the work being done by vessels at present on that route. The Karamania, which has been in the Mediterranean trade for some years, has been laid up at Marseilles for some time. The Anchor Line's biggest and finest steamer in due time will be the Caledonia, now getting into shape at D. & W. Henderson's ship yard, and expected to be ready for the Glasgow to New York service in March, 1905. She is longer and broader than the Columbia, and of about 10,000 tons, as compared with the Columbia's 8,400 tons. The Caledonia will have more of the Lucania and Campania appearance than the Columbia, and she will be one of the finest-looking ships sailing from the Clyde.

The Anchor Line carried during the year 1903 67,256 passengers by the steamers of their various services. Of this number 12,000 were cabin and second cabin passengers. These are the largest numbers ever carried by the Anchor Line in any one year.

Canada seems to be becoming less dependent on the ports of the United States for a winter outlet for her goods. In the winter of 1900-01 80 per cent. of the Dominion exports were sent by the ports of the United States, and in 1901-02 this percentage was 82. But in 1902-03 less than 70 per cent. of Canadian goods were forwarded through American ports. Of the wheat exports in 1902-03 more than 50 per cent. were sent through St. John and Halifax, whereas in the previous year these ports secured less than one-sixth.

The Scotch-built turbine-yacht Lorena has, in her turn, shown the value of the new form of motor. Running from Brightlingsea to Southampton she made a passage at an average speed of 12.4 knots, burning only one ton of coal per hour, with all auxiliaries going. The speed was maintained on two boilers in the face of an adverse tide and a fresh westerly gale from off Dungeness down to the Isle of Wight. This shows that turbine engines can be run at a moderate speed with economical coal consumption.

The total tonnage of the Allan Line, including the two coming turbine steamers, is 158,026 tons. A record of the passengers carried by this line to Canada and the United States since 1880 gives a grand total of 844,532, the figures for 1903 being in excess of any previous year. The next highest total was in 1888, when 48,206 passengers were carried.

The old single-turret monitors Nahant, Jason, Canonicus, Lehigh and Montauk, that for years have been anchored at League island, have been stricken from the navy list by order of Secretary Moody and ordered sold. These ironclads were authorized by act of congress April 17, 1862, and have long since outlived their usefulness.

FLOTILLA OF SUBMARINES.

England said to be Arranging for Construction of a great Number of Them—British Emigration Returns—Liverpool Shipping Letter.

Liverpool, Jan. 18.—Experiments conducted with the ten submarines of the Holland-Vickers type, built at Barrow for the navy, have been of so successful a character and have so fully demonstrated the usefulness of these small craft as instruments of war, that the British admiralty is contemplating the construction of a large flotilla at the earliest possible date. At present nine submarines are being built at Barrow for the admiralty, and a tenth is being designed, which will make twenty in all built at Barrow. The nine now in course of construction will be launched by about the end of March. It is then proposed to build twenty-seven more submarines in batches of nine at a time and to complete them with as much celerity as possible, as once it has been demonstrated that submarines are a useful adjunct to a navy, it is of imperative importance to the largest navy in the world that a large flotilla of this type of vessel shall be at the command of the admiralty and attached to the British fleet wherever warships are stationed. It is evident that in future submarines will play an important part in all naval engagements.

There has just been issued a statement showing the number of emigrants who left Liverpool for places out of Europe during the month and the twelve months ended Dec. 31 last. They are furnished by the commercial, harbor and statistical department of the Board of Trade and show that there emigrated to

	December	Twelve months ending Dec. 31.
United States	5,719	164,359
British North America	2,805	89,529
Australasia	276	2,264
Other places	846	9,836
Total	9,646	265,988

In this connection there has also been issued a return giving the approximate number of passengers carried by the various lines to and from America during the last year. From this it appears that west-bound the American Line carried 25,586, against 35,134 in 1902; Atlantic Transport Co. 3,022, against 4,062; Cunard (Boston) 31,131, against 27,527; Cunard (New York) 48,363, against 39,959; Dominion Line (Boston) 17,722, against 20,825; but adding the figures for the four White Star Boston sailings the total for the last year is 18,392; Hamburg-American 125,516, against 96,855; North German Lloyd 115,847, against 106,844; and White Star Line (New York) 64,636, against 58,623. The east-bound figures were: American Line 15,408, against 16,565; Atlantic Transport Co. 3,457, against 4,230; Cunard (Boston) 9,024, against 8,073; Cunard (New York) 25,239, against 22,921; Dominion Line (Boston, including White Star Boston figures) 8,282, against 9,209; Hamburg-American 34,875, against 31,992; North German Lloyd 50,778, against 42,247, and White Star (New York) 44,175, against 31,796.

The Right Hon. W. J. Pirrie of Messrs. Harland & Wolff, ship builders, Belfast, has this week been paying a compliment to the enterprise of his American friends. Speaking at a meeting of the Worshipful Company of Shipwrights, the other day, he said that "the movement in favor of the construction of large vessels in the United Kingdom had been checked in the past by the want of suitable dock accommodation. The Americans had realized that the only way to carry cargo cheaply was to carry it in deep-draught boats. In America some years ago he urged that 40 ft. of water should be allowed instead of 26 ft., and within a few years harbors were ready for the large boats. He regretted to say that equal expedition had not been shown in London, but he believed we should get the necessary accommodation by and by."

Beyond the winning over of a few Liverpool waverers, there has been no new development this week in the efforts being made to form the International Union of Sailing-Ship Owners. It is now considered certain that the movement will be successfully launched at the forthcoming International Conference, which is to be held in London, notices summoning which have just been issued.

In connection with the proposed British regulations issued by the Home Office for the prevention of accidents at docks, a conference of the National Union of Dock Laborers, consisting of representatives from the various British shipping centers, has been held in Liverpool to consider the proposed new rules. The conference unanimously decided to support all the Home Office recommendations, the principal points of which are a safety ladder in place of the present ship's ladder, which is a fruitful source of danger to life and limb, the landing ways 'tween decks, efficient staging, and the proper lighting of all approaches to dock work in the night time, and the testing and annealing of all chain gear used for the purpose of discharging and loading. The conference also decided unanimously to support the ladder invented by Mr. R. C. Scott of Liverpool, if the ship owners insisted upon the ladder being placed in the open hatchway. A national committee was elected to arrange the nature of the evidence to be given before the Home Office inquiry relating to the matter which is to sit at London, Liverpool, Glasgow, Cardiff, Newcastle and Belfast, and opens at London Jan. 25.

The McKay & Dix Verona Island Ship Building Co. has been formed to operate a ship yard in the town of Verona, Me. McKay & Dix are a New York firm of ship builders.

NEW YORK SHIP BUILDING DEPRESSED.

Not for many years have the ship building yards about New York had so few contracts on hand as now, owing principally to labor troubles. Over $3,000,000 is repairs alone, according to conservative estimates made by employers, have been lost to New York, most of it in wages, and even if stable conditions should be restored it would be a long time before the trade could reach the condition it had been in previous to these troubles. The strikes in the ship yards during the last eighteen months for higher wages or fewer hours of work were ordered, the employers say, without any consideration as to whether they could afford to pay higher wages. With the reduction in the hours of labor came a reduction in the amount of work which could be done in a day, and thus the ship builders were placed in the position of competing with other seaboard cities where wages were lower and where the labor rules were less tyrannical. Even the overhauling of transatlantic liners which used to be done in New York is deferred now, on account of the industrial conditions, until the vessels reach the other side.

Five firms have been driven to the wall, two of which are in the hands of receivers. This takes $17,000 a week in wages out of New York. The concerns which have been forced by the labor troubles to shut down are the Townsend-Downey yards at Shooter island and the Morse ship building yards, both of which are still in the hands of receivers; the Morgan Iron Works, the Perth Amboy Ship Building Co., and the Marine Dry Dock & Construction Co. Wallace Downey of the Townsend-Downey Ship Building Co. said a few days ago:

"The labor situation is largely responsible for the present dullness in trade, the trouble going further back than the last strike or series of strikes. It began three years ago, with the rapid rise of wages, the cutting down of the hours of labor and the great restriction of the amount of work performed per man. The last is to my mind the greatest factor in bringing about the present deplorable state of affairs, both for the employer and employe. It is safe to say that the volume of business has decreased about $3,000,000 in the past eighteen months, which must mean a much greater loss for workmen in this vicinity than it does for the employers."

Another large employer affected by the ship yard strikes said that other American ports had largely benefited from the work lost to New York. He estimated that forty transatlantic liners which used to get repair work done in New York are getting it done elsewhere. Regarding the building of ships of large tonnage in New York, he said: Until labor conditions are on a more stable footing any enterprise in the way of building ships of large tonnage is not to be looked for. Labor conditions could be made such as to make it possible to build battleships in New York. By this I do not mean that the wages would be cut down to any great extent. I mean that if employers had any guarantee that there would be no labor upheavals for some time and that employes and employers could work in harmony, the business could be developed so that the largest ships could be built hereabouts. Enterprise in this direction, however, would be useless under the conditions which have ruled in the past."

SHIP YARD NOTES.

The Kelley-Spear Co., Bath, Me., has just secured an order for a four-masted wooden schooner for New York parties. She will be 158 ft. long, 36 ft. beam and 12.5 ft. deep.

The steamer Capt. A. F. Lucas, an oil tanker, which was under way at the Trigg ship yard at Richmond, Va., when that enterprise failed, is now being completed by the Standard Oil Co., by whom the contract for the steamer was originally let.

Macconnell & Cook, No. 52 Broadway, New York, have just completed the design of a cruising launch 36 ft. over all, 8 ft. beam and 4 ft. 6 in. deep, with a displacement of about 12,000 lbs. on a draught of 2 ft. 9 in. They have worked out a propeller design on which a speed of 15 miles an hour is guaranteed in a continuous run. The hull is to be of oak, cedar and pine. The launch is for W. A. Brown of New York.

The Eastern Steamship Co. has mailed to stockholders the following financial statement: Net earnings of the companies for ten years prior to consolidation, $2,500,000; net earnings under consolidated management from May 1 to Dec. 31, 1902, $239,405; ten months to Oct. 31, 1903, $294,268; total net eighteen months, $533,673; bond interest, eighteen months, $108,000; balance, $425,673; 3 per cent. dividend paid Nov. 2 1903, $90,000; surplus $335,673. The balance sheet as of Oct. 31, 1903, shows a surplus over and above all liabilities of $1,432,378 with total assets and total liabilities of $4,193,429.

Representative Roberts has introduced a bill in the house of representatives to appropriate $4,500,000 for the purpose of constructing submarine boats, the type to be selected by the secretary of the navy. It is provided, however, that no type shall be submitted other than those by corporations who have heretofore built a submarine boat in this country. This would limit the competition to the Holland and Lake companies.

The Dominion government has had warrants issued against Capt. Russell of the steamer Clallam, recently sunk in Puget Sound, while on a trip from Victoria, B. C., to Seattle, Wash. The charge is manslaughter, the allegation being that the captain and officers were criminally negligent with the navigation of the steamer after she became disabled and before she sank.

CONCRETE STEEL LIGHTHOUSE.

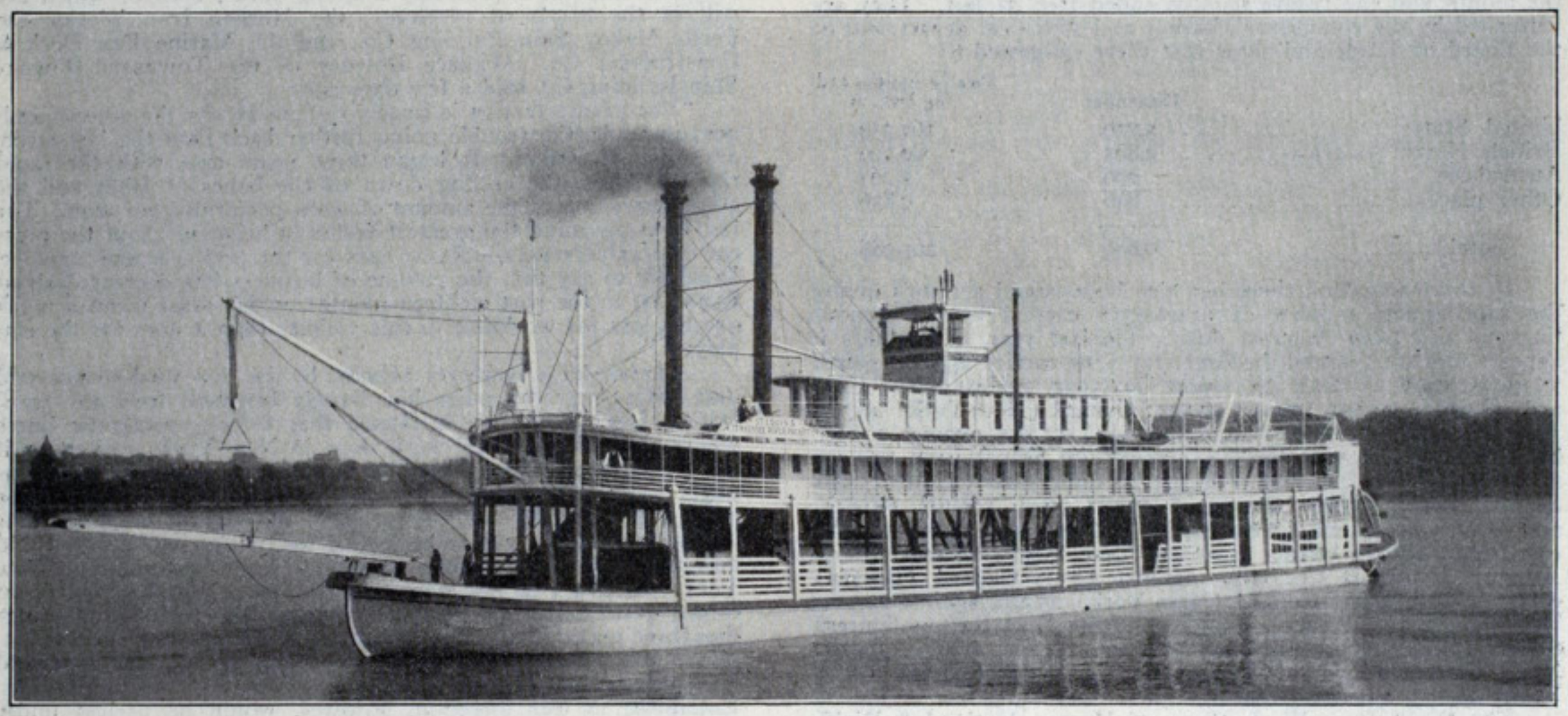
A concrete steel lighthouse has just been built by the Russian government at Nicolaieff to light the canal which joins that town to the Black sea. It has a thin circular shaft about 110 ft. high which has a diameter of about 6½ ft. at the top and straight sides slightly battered to a point about 40 ft. above the base where the batter increases and the sides are curved so as to widen to a diameter of 20.7 ft. at the base. This shaft is set on a circular cup-like foundation 8 ft. deep with a horizontal footing 28.2 ft. in diameter. The side walls of the foundation are battered and within them there is a circular space 19.7 ft. in diameter which is filled with earth and covered by the reinforced concrete floor of the shaft. The shaft is surmounted by a cylindrical chamber 14.8 ft. in diameter inside and 9.8 ft. high with reinforced concrete brackets carrying the overhanging floor. On top of the chamber there is a domed lantern about 6.8 ft. in diameter and 13 ft. high.

The shaft is made without interior divisions, floors or bracing and contains only a spiral staircase reaching to the upper chamber. The construction throughout of foundation, shaft, chamber, lantern and stairs is of reinforced concrete made in the proportion of 661 lbs. of Portland cement, 14 cu. ft. of coarse sand and 28 cu. ft. of washed gravel. The reinforcement in the shaft consists of horizontal circular ¾-in. steel rods about 1 ft. apart vertically and ⅞-in. vertical rods about 9 in. apart, wired together at intersections and spliced by short pieces lapped and wired over the joints. The foundation walls are reinforced by rods in the vertical and battered faces, and horizontal tie pieces. The footing, which is 30 in. deep, is reinforced by ¼-in. horizontal rods at right angles to each other near the upper and lower surfaces. The brackets supporting the floor of the upper chamber are made integral with the walls of the shaft and the floor and have their under sides curved to form mouldings. They are reinforced by horizontal and inclined rods wired to the vertical rods in the shaft and by vertical and diagonal rods wired to those in the upper and lower flanges of the brackets. The walls and roof of the chamber and lantern are reinforced with simple vertical and horizontal rods.

The lighthouse was proportioned for a wind pressure of 55 lbs. per square foot of the surface. All the reinforced rods were painted with cement grout before being bedded in the concrete. It is stated that the reinforced construction cost 40 per cent. less than a corresponding one entirely of brick or entirely of metal. The brick lighthouse would have weighed 1,365 tons against 460 tons which this one weighs.

CONSTITUTION CANNOT BE REBUILT.

It has been decided by the navy department not to undertake the rebuilding of the frigate Constitution, more familiarly known in history as "Old Ironsides." The memorial presented to congress by the Massachusetts Historical Society asking that the Constitution be made over into a training ship will receive an unfavorable reply, but the recommendation will be made that she be used as a naval museum. Rear Admiral Washington L. Capps, chief naval constructor, has submitted a report to Secretary Moody, in which he says that the ship is in too bad a condition to rebuild as suggested. The Constitution is now lying at the Boston navy yard, where she was recently examined by Admiral Capps, who found that her timbers had rotted. In his report, Admiral Capps suggests that the spar deck of the Constitution be used as a naval museum at the Boston navy yard, and that congress be asked for authority to name the next first-class battleship built for the United States navy the Constitution. Admiral Capps says: "While fully in sympathy with the suggestions made by the memorialists, it is considered quite impracticable to refit the Constitution as a training ship, the present condition of the hull of the vessel being such as to necessitate almost entire rebuilding, at a very large expense, and when rebuilt it is believed that the vessel would not be suitable as a sea-going ship for the navy, the man-of-war of the present day being so entirely dissimilar to the Constitution in hull, equipment and ordnance."



Type of American River Steamer—the City of Savannah. [*Built at Howards' Ship Yard, Jeffersonville, Ind.*

ANOTHER STEEL CORPORATION MERGER.

Definite announcement is expected soon of the merger of the Lorain Steel Co. with the National Tube Co., both of them subsidiary concerns of the United States Steel Corporation. The American Sheet Steel Co. and the American Tin Plate Co. were merged recently and the consolidated executive offices of these companies were moved to Pittsburg. The corporation has since been considering further amalgamation of plants. The National Tube Co. operates seventeen sub-companies and has five blast furnaces, with an annual output of 600,000 tons; nine rolling mills and steel works, and fourteen wrought iron, steel pipe and tube works. The Lorain Steel Co. includes plants at Lorain, O., and Johnstown, Pa., and heretofore has been a subsidiary to the Federal Steel Co. If the plan of merger is carried through the headquarters of the combined companies will be at Pittsburg, where, as rapidly as possible, the corporation will center nearly all of the executive offices of its subsidiary companies.

The expanding export trade in steel products has made necessary larger quarters for the United States Steel Products Co.—the company formed to handle the export trade of the Steel Corporation—and it will remove its offices in New York from the Empire building to the Battery Park building in State street. The New York offices of the American Steel & Wire Co., another sub-company of the Steel Corporation, now at No. 71 Broadway, will also be moved to the Battery Park building.

BRITAIN DEPENDENT UPON FOREIGN ORES.

Britain has become increasingly dependent of late years upon foreign ores in the production of pig iron. This is shown by the following table, illustrating the proportion of pig made from British ores and foreign ores in the fourteen years ending with 1902, inclusive:

Year.	British Ores. Tons.	Foreign Ores. Tons.
1888	5,130,861	2,868,108
1889	5,181,733	3,141,091
1890	4,848,748	3,055,466
1891	4,528,312	2,877,752
1892	4,041,178	2,668,077
1893	3,978,694	2,998,296
1894	4,347,472	3,079,870
1895	4,394,987	3,308,472
1896	4,759,446	3,900,235
1897	4,736,667	4,059,798
1898	4,850,508	3,759,211
1899	4,913,846	4,507,589
1900	4,666,942	4,292,749
1901	4,091,908	3,836,739
1902	4,400,431	4,279,104

The value of the pig made from British ores in 1888 was computed at £9,492,092, while the value of that made from foreign ores was £5,306,000. In 1895 the corresponding values were: Pig from British ores, £10,534,325; pig from foreign ores, £7,930,062. In 1902 the corresponding values were: Pig from British ores, £14,246,934; pig from foreign ores, £13,854,124.

LEADING THE WORLD IN EXPORTS.

The United States stands at the close of the calendar year 1903 at the head of the list of the world's exporting nations so far as relates to the exportation of domestic products. This fact is shown by a series of tables just presented by the department of commerce and labor through its bureau of statistics. It must be remembered, however, that very little of this export business was carried in American ships, so that, adding cost of carriage, the balance of trade is, as usual, with Britain.

There are only three "billion-dollar countries," considered from the standpoint of exportation of domestic products, and they are, in the order of the magnitude of their exports, the United States, the United Kingdom and Germany. In the calendar year 1903 the exports of domestic products were: From the United States, $1,457,565,783 in value, from the United Kingdom, $1,415,617,552; from Germany the figures for the full year have not been received, but an examination of the figures of the year for which statistics are available justifies an estimate of $1,200,000,000. It is only within very recent years that the United States has taken her place at the head of the list of the world's great exports of domestic products. The following table of domestic exports shows the advance of the United States from fourth place in 1875 to first place in 1903:

	1875.	1885.	1895.	1903.*
United Kingdom.....	$1,087,497,000	$1,037,124,000	$1,100,452,000	$1,415,617,552
France	747,400,000	596,000,000	651,100,000	812 000,000
Germany	593,052,000	680,551,000	789,660,000	1,200 000,000
United States....	497,263,737	673 593,596	807,742,415	1,457,565,783

*Figures represent nine months for Germany with balance estimated, and eleven months for France with December estimated.

The table which follows shows the exports of domestic products from the United States, United Kingdom and Germany in each year from 1875 to 1903, the figures being in all cases for the calendar year:

Calendar year.	United States.	United Kingdom.	Germany.
1875 ....$	497,263,737	$1,087,497,000	$ 593,052,000
1876	575,735,804	976,410,000	605,886,000
1877	607,566,495	967,913,000	656,982,000
1878	723,286,821	938,500,000	686,671,000
1879	754,656,755	932,090,000	660,352,000
1880	875,564,075	1,085,521,000	688,500,000
1881	814,162,951	1,138,873,000	707,978,000
1882	749,911,309	1,175,099,000	758,817,000
1883	777,523,718	1,166,982,000	778,257,000
1884	733,768,764	1,134,016,000	762,432,000
1885	673,593,596	1,037,124,000	680,551,000
1886	699,519,430	1,035,226,000	710,186,000
1887	703,319,692	1,079,944,000	745,896,000
1888	679,597,477	1,141,365,000	762,444,000
1889	814,154,864	1,211,442,000	753,222,000
1890	845,999,603	1,282,474,000	791,717,000
1891	957,333,551	1,203,169,000	755,771,000
1892	923,237,315	1,105,747,000	703,078,000
1893	854,729,454	1,062,162,000	735,886,000
1894	807,312,116	1,051,193,000	704,826,000
1895	807,742,415	1,100,452,000	789,660,000
1896	986,830,080	1,168,671,000	838,981,000
1897	1,079,834,296	1,139,832,000	865,124,000
1898	1,233,558,140	1,135,642,000	894,063,000
1899	1,252,932,344	1,287,150,000	1,001,278,000
1900	1,453,010,112	1,417,086,000	1,097,509,000
1901	1,438,078,651	1,362,727,000	1,054,685,000
1902	1,333,288,491	1,379,282,000	1,113,313,000
1903	1,457,565,783	1,415,617,000	a 1,200,000,000

a Estimates for closing quarter of year.

TEST OF SUBMARINE SIGNALING.

A submarine signal system invented by Prof. Gray and Arthur J. Mundy to reduce the danger of collision at sea has just been subjected to a service test. By means of this system the master of a vessel, standing at the wheel, can, it is claimed, have instant knowledge of the approach of another ship, even when 6 to 10 miles separate the two, and will know when he is nearing perilous shoals or reefs long before any whistling or bell buoy could send warning through a heavy fog. The recent test was made on the steamship James S. Whitney during a run, beginning at midnight between New York and Boston. It had been decided not to test the device for distances, but merely to establish its reliability over stretches suited to the ordinary requirements of commerce. But owing to a mishap in preliminaries, the signal squads at the first four stations were not notified in time to send their signals. However, when the Pollock Rip light was picked up the signal squad understood its work and was on the alert. When the James S. Whitney had the station 2 miles on her beam and the big steamboat was pitching heavily in the choppy sea the signal system was operated, it is said, with success. From all the other stations passed on the run, among them Pollock Rip shoals and Boston lightship, the signals were read with amazing distinctness.

The Gray-Mundy apparatus looks much like an ordinary house telephone, without the transmitter. It was hung in the pilot house of the James S. Whitney, within easy reach of the pilot. The connection between the sending and receiving stations is wireless under the water, the sea itself constituting the transmitting medium. In sending signals a bell is sunk 15 ft., and the wires of the receiving station run to an equal depth beneath the hull. The receiving instrument picks up the vibrations when the sunken bell is tolled. Experts on the steamboat are said to have been astonished at the simplicity of the device. They realized, though, the secret of the invention lay in the chemicals used in the receiver. Prof. Gray and his associates would not divulge the nature of the agents they employed, but admitted carbon played an important part in the composition.

OUTPUT OF BRITISH YARDS IN 1903.

Following is a summary of ship building returns of the United Kingdom in 1903, arranged in order of tonnage built by each concern:

Name of firm and place.	Number of ships.	Total tons.
Harland & Wolff, Ltd. (Belfast)	8	110,463
Swan, Hunter, Wigham-Richardson, Ltd. (Tyne)	22	66,452
John Brown & Co., Ltd. (Clyde)	6	55,152
Sir W. G. Armstrong, Whitworth & Co. Ld. (Tyne)	13	48,740
Russell & Co. (Clyde)	13	45,810
Workman, Clark & Co., Ltd. (Belfast)	7	44,738
Vickers, Sons & Maxim, Ltd. (Barrow)	—	42,912
Wm. Doxford & Sons, Ltd. (Wear)	10	39,866
Wm. Gray & Co., Ltd. (Hartlepool)	15	39,493
Fairfield Ship Building Co., Ltd. (Clyde)	8	39,053
Northumberland Ship Building Co. (Tyne)	8	34,085
Furness, Withy & Co., Ltd. (Hartlepool)	6	32,049
Short Bros., Ltd. (Wear)	6	30,558
Wm. Denny & Bros. (Clyde)	9	30,472
Charles Connell & Co. (Clyde)	7	28,908
J. Readhead & Sons (Tyne)	8	27,775
J. L. Thompson & Sons, Ltd. (Wear)	8	27,677
Sir James Laing & Sons, Ltd. (Wear)	6	27,459
A. Stephen & Sons, Ltd. (Clyde)	3	23,612
Richardson Duck & Co. (Tees)	7	22,259
Palmer's Ship Building Co. (Tyne)	9	22,094
Barclay, Curle & Co., Ltd. (Clyde)	5	20,944
Sir Raylton Dixon & Co., Ltd. (Tees)	10	20,407
Scott & Co. (Clyde)	6	20,198
Ropner & Son (Tees)	7	19,526
R. Craggs & Sons (Tees)	6	19,400
Caird & Co., Ltd. (Clyde)	2	19,005
D. & W. Henderson & Co. (Clyde)	11	17,989
A. Rodger & Co. (Clyde)	7	17,648
R. Stephenson & Co., Ltd. (Tyne)	5	16,796
John Priestman & Co. (Wear)	4	14,548
Tyne Iron Ship Building Co,, Ltd. (Tyne)	6	14,674
Hawthorn, Leslie & Co., Ltd. (Tyne)	6	14,370
Napier & Miller, Ltd. (Clyde)	5	14,362
Grangemouth & Greenock Dock Yard Co. (Clyde)	12	13,747
Irvine's Ship Bdg. & D. D. Co. Ltd. (Hartlepool)	7	13,381
Sunderland Ship Building Co., Ltd. (Wear)	6	12,735
Craig, Taylor & Co. (Tees)	8	12,014
Caledon Ship Bdg. & Engineering Co. Ltd. (Tay)	6	11,524
W. Pickersgill & Sons (Wear)	3	11,224
J. Blumer & Co. (Wear)	4	11,040
Earle's Ship Building Co., Ltd. (Humber)	6	10,973
Robert Thompson & Sons (Wear)	4	9,483
A. McMillan & Son, Ltd. (Clyde)	3	9,353
Ailsa Ship Building Co. (Troon)	10	8,120
W. Dobson & Co. (Tyne)	6	7,926
Cook, Welton & Gemmell (Beverley)	37	7,733
Simons & Co., Ltd. (Clyde)	8	7,250
Fleming & Ferguson, Ltd. (Clyde)	9	7,050
Bartram & Sons (Wear)	2	6,763
Clyde Ship Bdg. & Engineering Co., Ltd. (Clyde)	3	6,246
Laird Bros., Ltd. (Mersey)	7	5,638
Blyth Ship Building Co., Ltd. (Blyth)	6	5,394
Mackie & Thomson (Clyde)	13	5,242
Ramage & Ferguson (Clyde)	5	5,237
Smith's Dock Co., Ltd. (N. Shields)	37	4,984
S. P. Austin & Son, Ltd. (Wear)	4	4,842
Wood, Skinner & Co., Ltd. (Tyne)	6	4,556
Lobnitz & Co., Ltd. (Clyde)	11	4,534
Campbeltown Ship Building Co. (Campbeltown)	3	4,509
A. & J. Inglis (Clyde)	2	4,301
Osbourne, Graham & Co. (Wear)	1	3,820
A. W. Robertson & Co. (Thames)	25	3,369
Hall, Russell & Co. (Aberdeen)	13	3,163
Goole Ship Bdg. & Repairing Co., Ltd. (Goole)	12	3,056
Bow, MacLachlan, & Co., Ltd. (Paisley)	7	2,866
Tranmere Bay Development Co., Ltd. (Birkenh'd)	27	2,821
Dundee Ship Builders' Co., Ltd. (Dundee)	5	2,742
Londonderry Ship & Engine Co., Ltd. (Londond'y)	4	2,736
Scott & Sons (Clyde)	9	2,679

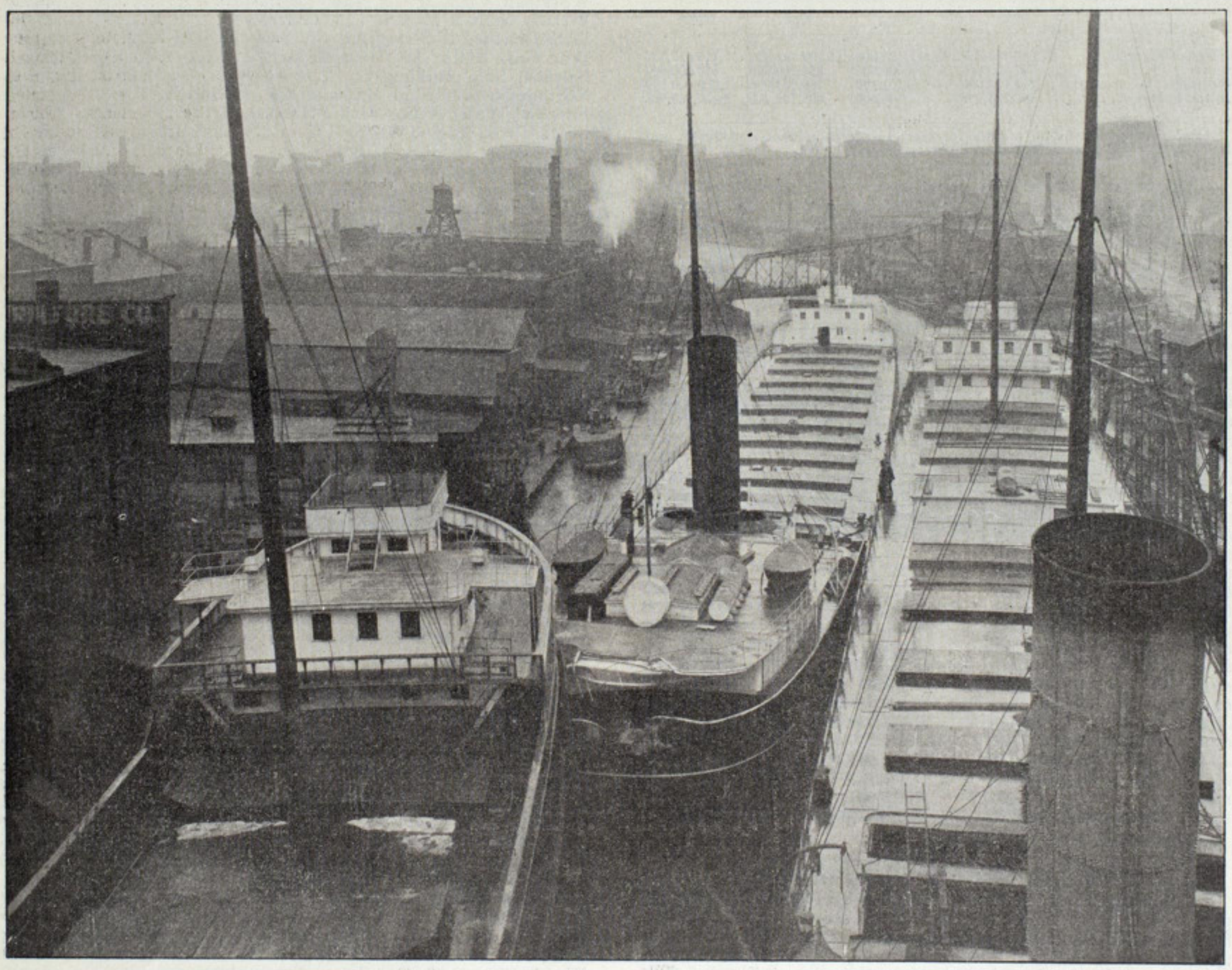
Contract for a steamer for the Weems Steamboat Co. has been let to the Baltimore Ship Building & Dry Dock Co. Work will begin at once and the steamer is expected to go into service in July. She will be of steel, single screw, 183 ft. over all, 44 ft. beam and 11 ft. deep. She will have triple-expansion engines with cylinders of 13, 21 and 31 in. diameter by 20 in. stroke, supplied with steam from three Scotch boilers, 12 ft. in diameter and 11 ft. 6 in. long. She will have thirty-nine staterooms and accommodations for about eighty second-class passengers.

NEWS OF THE GREAT LAKES

WORK OF THE JANUARY THAW.

Considerable Damage was Done by Floods at Cleveland and Lorain by Vessels Breaking Away From Their Fastenings.

Not for twenty years or more have spring floods done such damage at Lake Erie ports as did the proverbial January thaw of last week. As a rule, with the channels kept constantly open by the fire tugs, excess of surface drainage, occasioned by melting snows, is easily and safely cared for. But this was a thaw which broke all bounds in its suddenness and violence. In Cleveland it came down like a wolf on the fold at 7 o'clock last Friday morning and the steamer William E. Reis of the Mitchell fleet, moored just above Columbus street in the Cuyahoga river, broke away like a young colt, to use the simile of the watchman aboard, and started down the stream with the fast-moving current. The Reis had 4,500 tons of iron ore in her. She had been fastened for the winter and had in addition a 4,000-lb. anchor out. But, owing to her draught, which was about 15 ft. 8 in. aft, it was impossible to moor her closely to the dock. The sudden onslaught of the waters created a strong current between her and the dock and she had to go. Doubtless the dragging anchor acted as a sort of rudder to steer her down the stream. At any rate, down she swept majestically, stern first, while the tenders on the Center street and Valley railroad bridges watched the spectacle with their hearts in their mouths. They lost no time in swinging their bridges in order to give this giant nomad a free passage. Meanwhile the steamers James E. Eads, owned by the Steel Corporation, and J. W. Moore, owned by Frank Osborn and others, were lying in the path of the Reis, both being moored at the coal docks above the Center street bridge. In rounding the bend above the bridge the Reis struck the bow of the Moore and the Moore in turn struck the Eads which was lying just below it. The force of the impact was such that both steamers were torn from their moorings and, being light, they moved swiftly down the stream as a sort of advance guard for the Reis. It was extremely fortunate indeed that the tenders of the Center and Valley bridges were enabled to swing them in time, for they are comparatively slight structures and would have undoubtedly been carried off their abutments by the momentum of the steamers. As it was, the Moore alone gave the east abutment of the Center street draw a jab as she went by, denting it a little. The Eads then brought up with a crash against the east abutment of the Superior street viaduct, a heavy stone structure which took the impact without imperceptible injury. The blow caused the Eads to swing towards the west shore, which deflected the Moore, fast following, to the east, and she (the Moore) crashed into the dock of the General Cartage & Storage Co. on the east side of the river and became firmly wedged in between the dock and the east abutment of the viaduct. The dock of the storage company was ripped up and part of the timbers brought to a vertical position by the Moore. By this time the heavily-laden Reis had caught up with the procession of runaways and striking the Moore on the bow slid along to the west until its stern was firmly caught between the bow of the Moore and the side of the Eads. The steamers were so hopelessly jammed together as to render it practically impossible to pull them apart while the ice and current lasted. The Moore's stern was badly torn and its seams sprung so that it began leaking considerably. The stern of the Eads is badly damaged where it struck the viaduct and the



View from the Superior Street Viaduct showing the steamers Eads, Reis and Moore jammed together.

stern of the Reis is also badly torn. Of the vessels only one, the Reis, was carrying winter insurance.

The task of dislodging the vessels, when it was attempted on Monday of this week, proved a bad one. The tug Frank W., one of the most powerful at the port, tried to push the Eads, which is the most westerly of the three vessels, into the stream, but the big freighter would not budge. Capt. W. W. Smith, marine superintendent of the Pittsburg Steamship Co., decided that the best way to dislodge her was to cut about 3 ft. off her fantail and remove about half a dozen piles that are under her stern. These plates would have to be removed anyhow when she goes into dry dock. The work of cutting 3 ft. off the Eads' stern was begun on Monday.

Capt. A. B. Davis of Milwaukee, wrecking master for David Vance & Co., representatives of underwriters who have the insurance on the Reis, took charge of that steamer. He decided to make an effort to heave her up with her own windlass by supplying steam to it from one of the tugs. A 10-in. pump was put to work pumping water out of the Moore. It will take several days to get the Moore out of the way as a large portion of the dock on which she rests will have to be cut away before tugs can work on her.

After working for two days on the steamer Eads it was concluded that it would be impossible to move her until the Reis had been released. After cutting off 3 ft. of the fan tail of the Eads and removing several piles at her stern, it was found impossible to move her sufficiently to drop her down the river. It is thought that her shoe is caught in some piling and that in addition her bow is crushed against the Valley railway bridge by the Reis. The attempt to warp the Reis by means of injecting steam into her windlass failed and it was concluded that it would be useless to attempt to remove her until the Moore was out of the way. The Moore, as stated, is jammed against the east dock and has a bad list by reason of the pressure of the Reis against her. She is also full of water. Extra pumps were placed on the Moore on Wednesday and it is expected that when the water is removed from her she can be pulled out of the way sufficiently to release the Reis. It is mighty slow work, as all the elements are against the workmen.

It is customary during the winter to keep merely a watchman aboard the moored vessels, but in the case of the Reis there were two watchmen, each standing a six hour shift. On the Eads it so happened that a gang of boilermakers were at work repairing the boilers. They were mightily frightened when the steamer started down stream but regained their composure when the vessel struck the viaduct and resumed their work complacently upon the boilers while thousands of spectators stood upon the viaduct and listened to the sound of their hammers. There were quite a number on board the Moore, too, and the first knowledge they had of any disturbance was when the Reis struck their bow. They were at breakfast at the time and the force of the collision was sufficient to send them sprawling along the dining room.

At Lorain the thaw made sad havoc of affairs. The overflow came suddenly and it is probable that the waters were dammed at the Nickel Plate bridge, for when the flood reached the plant of the American Ship Building Co. it submerged it to a depth of 6 ft. in all parts, but ten minutes later had receded again. A liberal deposit of mud was left everywhere, which made the appearance of things much worse than they really were. It did not take the workmen long to put the operating part of the plant in good order again. But the congested waters in passing on to the lake did other mischief. The new Hawgood steamer, structurally complete except that her machinery is lacking, was thrown clear across the river, acting as a sort of combination bridge and dam temporarily. The schooner Three Brothers was lifted high and dry on the bank and a couple of scows made their way into the lake over what is usually dry land. They did not follow the river bed at all. No. 8 dredge, belonging to the L. P. & J. A. Smith Co. of Cleveland, was swept out into the lake and sunk; two large mud scows were lifted and left on the land about a quarter of a mile from the natural bed of the river, and one large fuel scow was picked up and put on top of the dock. The L. P. & J. A. Smith Co. estimate their loss at about $12,000. The American Ship Building Co. cannot as yet put any estimate upon their actual monetary loss but do not regard it as serious. The steamer H. C. Holden, belonging to the Mitchell fleet, was supposed to be moored past all reasonable contingency, but she broke away nevertheless from her fastenings and drifted down to the mouth of the river, being prevented from entering the lake by the ice pack. She was damaged only slightly. The E. M. Peck, another steamer, also fetched up in this same ice pack. A dredge owned by Carkin, Stickney & Cram; a scow, owned by Stickney Bros.; a concrete mixer and scow owned by Gaynor Bros.; the fishing tug Gull, owned by the Ranney Fish Co.; and the tugs A. N. Burch and Susie B. were swept out into the lake by the force of the waters. The attempt to recover some of this floating property resulted disastrously for the tug Cascade, owned by the Baltimore & Ohio railway and operated under a pool arrangement by the Great Lakes Towing Co. The Cascade had gone out to pick up a scow found floating near Avon point. She was endeavoring to reach port with the scow when the storm broke upon them and she was forced to abandon the scow in order to save herself. The journey back into port was a fight against a terrific northeast gale, accompanied by snow so thick as to form a veil, and the Cascade was unable to weather it. She sank in 40 ft. of water about 1,000 ft. northeast of the new government breakwater at Lorain. Her crew of thirteen managed to escape by crawling up on the ice but they reached the shore under great difficulty. One of their number, Harry Courtright, fell into the open water but was rescued by his companions. The dredge belonging to Carkin, Stickney & Cram, and one of the scows were found embedded in the ice near Beach point, a few rods from the shore, by the tugs Frank W. and C. R. Edson, which had gone on the search from Cleveland. On board the dredge were Michael Southwell and Charles Ellison, who had crawled from shore along a plank to it. They were bailing out the water, for the dredge was in a dangerous position, and they were pretty thoroughly exhausted. The dredge and scow were by the united efforts of both tugs pulled from the ice. One of the tugs then proceeded a few miles west and picked up the concrete mixer and another scow. The return trip to Cleveland with these unruly tows was a hazardous one. Both scows and dredge were in a leaky condition and the concrete mixer had also taken considerable water aboard. The mixer was especially in danger of capsizing, so that the men aboard her had to constantly shift stone to correct the list. Finally the harbor of Cleveland was reached, ships and men looking like phantoms in their coats of ice.

LAKE ITEMS OF INTEREST.

Evidently, according to a hearing before the river and harbor committee at Washington this week, the Wabash railway which controls the Wheeling & Lake Erie and draws on lake business from Toledo, Huron and Cleveland, intends to make Huron its principal port on the lakes. A delegation urged the committee to recommend and provide for a 20-ft. channel at Huron, and a letter was read from President Ramsay of the Wabash system promising to make big improvements at Huron and predicting a volume of 2,000,000 tons of coal annually to be handled at the port as a complement of incoming ore shipments. Huron already has a narrow 20-ft. channel made by private interests, but the entrance to the harbor is contracted and it will be necessary to remove one of the piers in order to broaden the entrance. The delegation urged that this be done; but nothing can be done this year as there is to be no river and harbor bill.

Passenger interests along the chain of great lakes are endeavoring to form an association to be known as the International Water Route Passenger association, embracing the great lakes and American rivers. A meeting of those interested was held in Detroit recently, Mr. A. A. Schantz of the Detroit & Cleveland Line presiding. The purpose is to organize the fresh water lines upon a general plan somewhat similar to the railways. The following committee upon organization was appointed: R. F. Church, Chicago, general freight and passenger agent of the Northern Michigan Transportation Co.; C. E. Markham of Buffalo, general passenger agent of the Anchor Line; W. F. Herman of Cleveland, general passenger agent of the Cleveland & Buffalo Line; B. W. Folger of Toronto, manager of the Niagara river Line. The next meeting will be held at Detroit Feb. 17.

Since the recent annual meeting of the marine engineers in Washington, the impression has gone out that an effort will be made to re-establish for next season the scale of wages which prevailed in 1903, and which ranged from $150 and $100 a month respectively for chief engineers and first assistants on first-class steel steamers down to $95 and $65 respectively for chiefs and assistants on the fourth-class of wooden steamers. Of course wages cannot be fixed until meetings are had with the vessel owners towards spring. The engineers are probably standing on last year's schedule now with a view to accepting some reduction which will probably be required if the business outlook does not improve.

W. S. Duncan of the Detroit White Lead Works is still receiving congratulations from vessel men around the lakes on account of the very liberal manner in which he entertained them at the recent meeting of the Lake Carriers in Detroit. The White Lead Works held open house on the parlor floor of the Cadillac, and with the assistance of a few of his friends among the vessel men Mr. Duncan managed to extend the greetings and hospitality of the Detroit house to practically every vessel owner in the hotel.

We have reliable information to the effect that the Great Lakes Engineering Works of Detroit has worked out successfully a new and novel design for steel bulk freight steamers without stanchions. The original designs were made some time ago and have been under careful study and revision since the time of their inception. Experts in marine construction who have seen the designs are enthusiastic in their commendations.

A good work in Algonac, Mich., is known as the "Sailors' Supper." Every winter the ship masters and others in vessel lines get up an entertainment of a supper kind for one of the churches or some deserving charity. This winter Disciple church was benefited to the extent receipts footing up $215. Next year's receipts will go to the Catholic church.

PLEASED WITH THE SHIP BUILDING NUMBER.

Walter J. Ballard of Schenectady, N. Y., is a well-known writer on subjects pertaining to American shipping. He has made a study of shipping and ship building. Following is a letter from him:

Editor Marine Review:—All I want to say is that the 1904 ship building edition of Marine Review, January 21, is a daisy.

WALTER J. BALLARD.

Schenectady, N. Y., Jan. 24, 1904.

Harland & Wolff, Belfast, Ireland, have received an order to build a steamer 755 ft. long for the White Star Line. This will be 30 ft. longer than the Baltic, the largest ship in the world, launched two months ago from Belfast for the same company.

PROPERTIES OF THE CONSOLIDATED LAKE SUPERIOR.

The following official statement is given out as to the present status of the properties at Sault Ste. Marie of the Consolidated Lake Superior Co.:

"While only three of the subsidiary companies of the Consolidated Lake Superior now in operation are earning anything above operating expenses, if the money was provided for operation and working capital by Feb. 15, by May 1 everything would be running on earning basis of $168,500 a month or $2,022,000 per annum. The pulp, veneer and saw mills have been most affected, as men should have been in the woods all winter to get out wood enough to keep them all continuously employed. The saw mill, however, could start May 1 and be supplied with sufficient logs to run steadily. There is 6,000,000 ft. available as soon as the streams open in the spring and further supply could be cut and sent in by rail before the 6,000,000 ft. is exhausted. The veneer mill could be kept running steadily after July 1 by logs cut in woods and sent in by rail. One pulp mill could run from May 1 with logs now frozen in the streams, and by Aug. 1 enough could be procured by rail to keep both pulp mills running continuously thereafter. The steel plant could run now with American pig iron, but of course more money could be made by using Canadian pig iron. Ore to make Canadian pig iron cannot be brought in before May 1.

"The charcoal retort plant cannot be run until the steel plant starts up, as there is no market now for the charcoal. The blast furnaces in the steel plant will require 15,000 bu. of charcoal per day. The Helen ore mine and car shops cannot earn before May 1. The three companies now on an earning basis are the Ground Wood Pulp Mill, the Tagoma Water & Light Co. and the North Shore Railway. The Algoma Central Railway and the street railway companies on the American and Canadian sides while not making any net profits are earning operating expenses.

"Of the companies that will contribute toward an earning basis of $168,500 some will work under different conditions than they did before the shut-down occurred. The veneer mill could now earn $3,000 a month. It never ran more than half capacity because there was no money to build warerooms and the mill was in the market only five months. Had the mill kept on going it would have sold full capacity inside ninety days, and at half capacity made $1,200 a month. The sulphide pulp mill had just been repaired and improved to earn $4,000 a month when the shut-down came. The paper mill, which can earn $3,000 a month, has just been completed and has not yet run on regular order. The Copper Nickel Reduction works, if money is furnished, can be completed in sixty days and can earn $30,000 a month, and the Michigan & Lake Superior Power Co., which now has only a half of its power rented, could earn $25,000 when all the power is being used. The estimates made for other companies are on the basis of what they have already earned."

HEAD OF THE LAKES COMMERCE.

Capt. Charles L. Potter, United States engineer in charge of river and harbor work on Lake Superior, has just completed commercial statistics of Duluth-Superior harbor for 1903, which show a substantial increase of freight handled but a decrease in valuation. The total amount of freight, receipts and shipments combined, last season was 17,966,718 net tons, as compared with 17,505,793 tons in 1902, a gain of 460,925 tons. The valuation of the commerce was $177,594,212. There is a falling off in the valuation, in spite of the increase of freight tons, due to varying prices of commodities and probably a decrease in the movement of the higher-priced articles. This increase of nearly half a million tons in head-of-the-lakes commerce is creditable in view of the falling off in ore shipments and also in grain. The enormous movement of coal to the head of the lakes, which broke all records for any one season, was in large measure the saving of the harbor in showing the customary increase of some volume. The coal receipts were 4,219,211 tons, an increase of over 1,500,000 tons. Other principal items were as follows: Wheat 25,995,333 bus., flax 15,406,057, barley, oats, rye, corn 11,014,110, flour 5,967,685 barrels, iron ore 10,387,457 (net) tons, oil 104,784 barrels, manufactured iron 91,165 tons, general merchandise 216,787 tons, salt 401,960 barrels, copper 33,683 tons, fish 2,039 tons, etc.

LARGE WATER POWER UNDERTAKING.

Duluth, Jan. 26.—Mr. A. B. Wolvin has resigned from the directorate of the Great Northern Power Co. of Duluth on account of a pressure of other business and has been succeeded by M. H. Alworth, one of the wealthiest men of Minnesota. Alexander McDougall is a member of the executive committee of the company. This company has just called on hydraulic engineers and manufacturers for proposals for machinery, which is to be delivered in about a year. These proposals include three 12,500 H. P. turbines on vertical shafts to run at 250 revolutions a minute under a head of 365 ft.; also turbine exciters, governors and other hydraulic machinery for a 35,000 H. P. installation. The plant will be erected with provision for expansion, and it is intended that 80,000 H. P. shall be installed very shortly. The company will furnish power for plants at Duluth and Superior and probably for the complete electrical equipment of the present steam ore-carrying railroads in northern Minnesota. It will also add to the equipment a direct hydraulic plant to furnish 12,000 H. P. for paper and pulp mills, to be located at the head of the deep-water channel of the Duluth-Superior harbor.

DULUTH GRAIN OUTLOOK.

The outlook as to the movement of grain from the head of Lake Superior in the spring is not encouraging from a vessel standpoint. Stocks of grain in store in local warehouses at Duluth Jan. 17, 1903, and Jan. 16, 1904, were as follows:

	Jan. 17, 1903.	Jan 16, 1904.
Wheat, bushels	3,785,182	2,494,056
Oats, bushels	300,287	971,518
Rye, bushels	49,855	89,309
Barley, bushels	364,389	375,384
Flax, bushels	3,225,362	5,492,987
Total, bushels	7,725,075	9,423,254

G. A. Tomlinson, vessel agent of Duluth, says: Receipts of grain average about fifty cars a day. There is no reason to assume that country supplies are large. It is absolutely certain, therefore, that there will be little or no large demand for vessels to carry grain at the opening of navigation, and information from Winnipeg is to the same effect. Some of our shippers report they have inquiry for opening shipment, but vessel owners seem to be in accord in not obligating their tonnage until labor and general freight conditions are settled. The movement of coal to interior points has been very active since the close of navigation. Although, it is hardly probable the local stocks will be exhausted by April 1, I do not look to see much of a surplus. The weather of late has not been cold. Ice in the bay is about 2 ft thick and there is a large field outside the harbor.

AROUND THE GREAT LAKES.

Lakewood Steamship Co. is the name of the corporation organized for the operation of the large steel freighter which the American Ship Building Co. is building at Cleveland for Charles L. Hutchinson and others.

A new life-saving station, costing about $10,000, is to be erected next year at Muskegon. Lieut. J. E. Reinberg, inspector of life-saving stations on Lake Michigan, is at Muskegon making preliminary arrangements for the work.

Mr. J. C. Gilchrist, who owned a controlling interest in the Empire Ship Building Co., Buffalo, has sold his stock to John Bateman and other Buffalo stockholders. The company owns two floating dry docks and a plant for general repair work.

Capt. Austin A. Kirby died at Huron, O., last week at the age of eighty-six years. He was born at Genoa, N. Y., in 1817 and began his career in 1829. In 1835 he became master of the steamer Decatur and sailed numerous craft until 1873 when he was made commodore of the vessel interests of the late Eber B. Ward. He retired from sailing in 1880.

Members of the Marine Engineers' Beneficial association at Erie elected the following officers recently: Past-president, Wm. Milington; president, Andrew Chapman; first vice-president, Fred Ackerman; second vice-president, Chas. Awgood; recording and corresponding secretary, Frank Feeney; financial secretary and treasurer, Edward Crossley; conductor, Bennett Everett; chaplain, Wm. Pender; door keeper, Leander Stuart; trustee for three years, Andrew O'Neil. Mr. A. Chapman was delegate to the national convention and Edward Crossley alternate.

The Licensed Tugmen's Protective Association, in convention at Toledo last week, elected the following officers: Grand president, James Welsh, Duluth; first grand vice-president, J. H. Page of Toledo; second grand vice-president, Owen McAntee of St. Joseph; third grand vice-president, Stephen P. Hogan of Erie; grand secretary, H. H. Vroman of Buffalo; grand treasurer, Peter Gagnon of Two Rivers. The grand executive committee consists of all the grand officers. The new grand president is a well known engineer of Duluth, and the general opinion is that a good selection was made.

At the annual meeting of the grand lodge of the Ship Masters' Association, held at Marine City, the following officers were elected: Capt. Herbert H. Parsons, Detroit, grand president; Capt. C. A. Potter, Chicago, grand first vice-president; Capt. H. W. Stone, Cleveland, grand second vice-president; Capt. Thomas Jones, Cleveland, grand treasurer; Capt. F. B. Higgle, Chicago, grand financial secretary; Capt. J. B. Warner, Toledo, grand chaplain; Capt. J. A. MacDonald, Marine City, grand marshal; Capt. Edward Reynolds, Port Huron, grand warden; Capt. T. M. Hough, Chicago, grand sentinel.

Lighthouse officials give notice that on the opening of navigation, 1904, the following permanent lights will be established in the structures at Tidal shoals range light station: Rear light.—A fixed red light of the fourth order, in the white, octagonal, pyramidal, frame tower, surmounted by a black lantern, recently erected near the railroad embankment at the southerly end of the International railroad bridge. The focal plane of the light will be 57 ft. above lake level, and 52 ft. above the base of the structure, and the light will be visible 15 miles in clear weather, the eye of the observer 15 ft. above the lake. Front light.—A light of the fourth order, illuminating the entire horizon, and showing fixed red varied by a red flash every 10 seconds, in the white, conical, iron tower, the height of which was increased 10 ft., on the outer end of the north pier at the westerly entrance to St. Mary's Falls canal. The focal plane of the light will be 40 ft. above lake level, and 35 ft. above the base of the structure, and the light will be visible 13½ miles in clear weather, the eye of the observer 15 ft. above the lake.

SEEN AND HEARD ON THE LOOKOUT.

There are several well-known reasons for a vessel captain's inclination to substitute Lascars, Malays, Arabs, etc., for his crew of white men, not least of which is the fact that while trading in the tropics the service of these dark-hued sailors and firemen is eminently satisfactory to the officers in charge. As if to prove the truth of the saying that "environment influences character," these Orientals, so meek, servile and deferential while trading in the tropics, become sullen, obstinate and refractory when transported to excessively cold regions. In the case of the Cingalese crew herewith related your readers may undoubtedly come to the conclusion that there was a justifiable reason for their refusal of duty. A British tramp steamer, Nithsdale, recently made New York harbor from Calcutta. Though this fact in itself cannot be regarded as unique, the ship's crew appeared decidedly out of keeping with their strictly arctic surroundings. While the captain, attired in the heaviest of winter clothing, pursued his monotonous rambles across the deck in a vain attempt to keep warm, the crew, dressed, or rather undressed, according to the dictates of the fashion prevalent in Calcutta, had their first experience at snow-shoveling. After the steamer had been tied up to her pier the deckhands, as well as the "serang," or Cingalese boatswain, went on strike, and refused to leave the forecastle; and as soon as the fires were drawn preparatory to scaling the boilers, the firemen joined the mutinous deckhands in an idle protest against the unbearable weather conditions. It proved to be a strike beyond the reach of either arbitration or diplomacy. Labor, in the guise of flimsily-clad Cingalese mariners, sent this ultimatum to the representatives of capital inhabiting the after part of the vessel: "Only upon being provided with white men's clothing do we, the crew in the forecastle assembled, consent to pursue our calling as per the agreement signed in Calcutta." As neither the mates nor the engineers possessed a sufficiency of spare clothing to appropriately cover this wide expanse of dark skin, the odd dozen Orientals next proceeded to the British consul's office, and from there to the seamen's branch of the Legal Aid Society. Suffice it to be remarked that the men gained their point—at least they were provided with white men's clothing commonly designated as "second hand." The captain entered the plea of having cautioned his crew at the time of shipping to make provision for the cold weather which they would certainly encounter north of Cape Hatteras. How a Cingalese sailor can defray the cost of a reasonably suitable outfit for North Atlantic voyaging when his assets do not amount to more than one month's salary in advance must remain a mystery to anyone conversant with the East-Indian merchant's prices. In this connection I may mention that upon a French sailing ship's hour of departure for extreme cold regions a government official comes on board to inquire into the condition of the sailor's "dunnage." Each member of the crew of a French vessel bound round Cape Horn, for instance, can claim three months' salary in advance. Some provision should be made to preclude the possibility of a repetition of the pathetic spectacle seen in New York on the occasion of the Nithsdale's arrival, when a dozen Oriental seamen with covering of mosquito-wing kind paraded bare-legged through the snow-covered streets.

Marine publications in England, as well as on the continent of Europe have of late given considerable attention to "crimping" in American seaports in general and in the port of New York in particular. Upon the occasion of a visit to the office of the commissioners who license these houses in New York I was given an opportunity to peruse a mass of literature—ancient and otherwise—bearing on this matter. There are in New York city exactly seventy of these "homes," and it appeared that the police record of each successful applicant for a license is yearly placed on file in this office. According to the reports so courteously submitted by the captains of the different precincts, it is evident that of the seventy men who hold a license this year sixty-nine have an excellent reputation in police circles. The exception, or No. 70—another number was written on the reverse side of his photograph which was taken some years previous at police headquarters—had been caught "with the goods." The objections of the waterfront missionaries to the granting of a license to this man could not be considered by Lawyer Clark H. Abbott, assistant secretary of the board of commissioners, in view of the fact that a governor of the state had pardoned the ex-convict, thus making the latter's $20 license fee acceptable under the law. And to all and every one of those who keep urging the board to refuse the renewal of a license to present holders Mr. Abbott appears to have answered with monotonous regularity: "Bring a charge; specify the complaint; enter some reasonable protest, and the criminal prosecution of the accused, preparatory to the revocation of his license shall surely result. After the police authorities had testified to the purity of the boarding masters' lives, the board of health was requested to inspect the sanitary arrangements in their residences. Advices from the latter officials are directly acted upon, and, incidentally, cause Mr. Abbott to lead the life strenuous. But those among the sailors' friends who so impotently object to either the manner in which some of these places are conducted, or the character of the proprietors, may be assured that these "sailors' homes," unlike the poor, are not always going to be with us. The foundations of the majority of these licensed houses rest on innumerable "advance notes." Stop the issuance of these notes, and the sailors' boarding house as conducted at present becomes extinct. But as long as there are reckless, extravagant and ignorant sailors a refusal to grant the "month's advance" would entail even more hardship than anything of which these seventy licensed individuals may have been guilty. It should further be understood that the seamen patronizing the worst of these places do so only as a last resort—when they are "on the beach," as they so expressively term it; and from the fact that the number of seamen actually "on the beach" is yearly decreasing, the doom of the lately so-much-criticized, typical sailors' boarding house may safely be predicted.

Any large object, a log for instance, found floating in a navigable channel is quickly described as a serious menace to shipping on the score that it is quite probable that this floating nuisance will disable a steamer's propeller. No one can deny that these obstructions have caused many mishaps, but the disablement of propellers is more often due to the so-called "racing" of the engines. The average ocean passenger abhors that motion of the ship so conducive to sea-sickness and known as "rolling." During the process of rolling, however, the propeller manages to keep fairly well submerged. A more serious annoyance, especially from the engineer's standpoint, occurs when running into a head-sea. In every maritime country, and especially in this land of invention, devices for automatically shutting off steam from the cylinders have been experimented with. Most of them are very appropriate in theory but prove unavailable in practice. The customary mode of procedure in the engine room when high head seas proclaim "racing engines" the fashion, is to station a man at the throttle valve. This animated regulator must speedily learn at what stage of the boat's head foremost dive steam should be refused to those greedy cylinders. A failure to supply steam at the right time of the propeller's resubmerging may stop the whole complicated machinery. Advocates of the turbine claim that this engine, at a time when racing is in order, will demonstrate its superiority over the older and more involved type. F. H.

MINIATURE CUNARD FLYER.

Concerning the experiments which the Cunard Steamship Co. is now making with a miniature flyer, the Liverpool Journal of Commerce says:

"The speculation that has been indulged in with respect to the building and propulsion of the proposed 25-knot Cunard liners has helped to provide a great amount of recreation for newspaper readers. A little respite has lately been enjoyed, for the attempts to rush the issue of the expert commission on turbines have failed signally and the public have become tired of the tales which have been told upon the subject. The Cunard Line, and those working with the company, have, however, been working quietly and steadily, and before long demonstrations may be expected of a very practical nature, and of immense value. These will be given by means of a miniature vessel, constructed on the lines which have been found by tank experiment to give the form best suited to obtain and maintain the enormous speed required under the government contract for the two flyers. At the boat building yard of Messrs. Buchanan at Low Walker on the Tyne is a craft in course of construction which perfectly embodies the lines which it is found by theory and tank experiment offer the least resistance to the onward progress of an object capable of fulfilling the requirements of Atlantic mail and passenger steamers through the water. The craft in question is about 40 ft. in length, and the object is to obtain by practical demonstration information which will lead to the adoption of the very best type of hull to fulfil the onerous condition of speed laid down for the projected masterpieces. It is a significant fact that the 'model' is being built on the Tyne, and helps to lend to the generally-accepted belief that Messrs. Swan, Hunter, & Wigham-Richardson are to be entrusted with the production of one of the two steamers. Indeed, the 'model' is the object of continuous attention at the hands of the noted Wallsend builders, and it is stated that she is being built for the firm. It is gratifying to find that so much is being done in the way of experiment before finally entering upon the expenditure of such an enormous sum of money as will be necessary to build and equip a 25-knot ocean liner, as an error perceived too late might almost spell ruin to one of the most ambitious projects ever entered upon in naval architecture."

OPPOSED TO FRYE'S PHILIPPINE BILL.

Secretary Root has written to Senator Frye, chairman of the senate committee on commerce, disapproving of the bill now before the senate restricting to American shipping all government transportation between the United States and the Philippines. He favors, however, legislation giving American shipping the preference. He says:

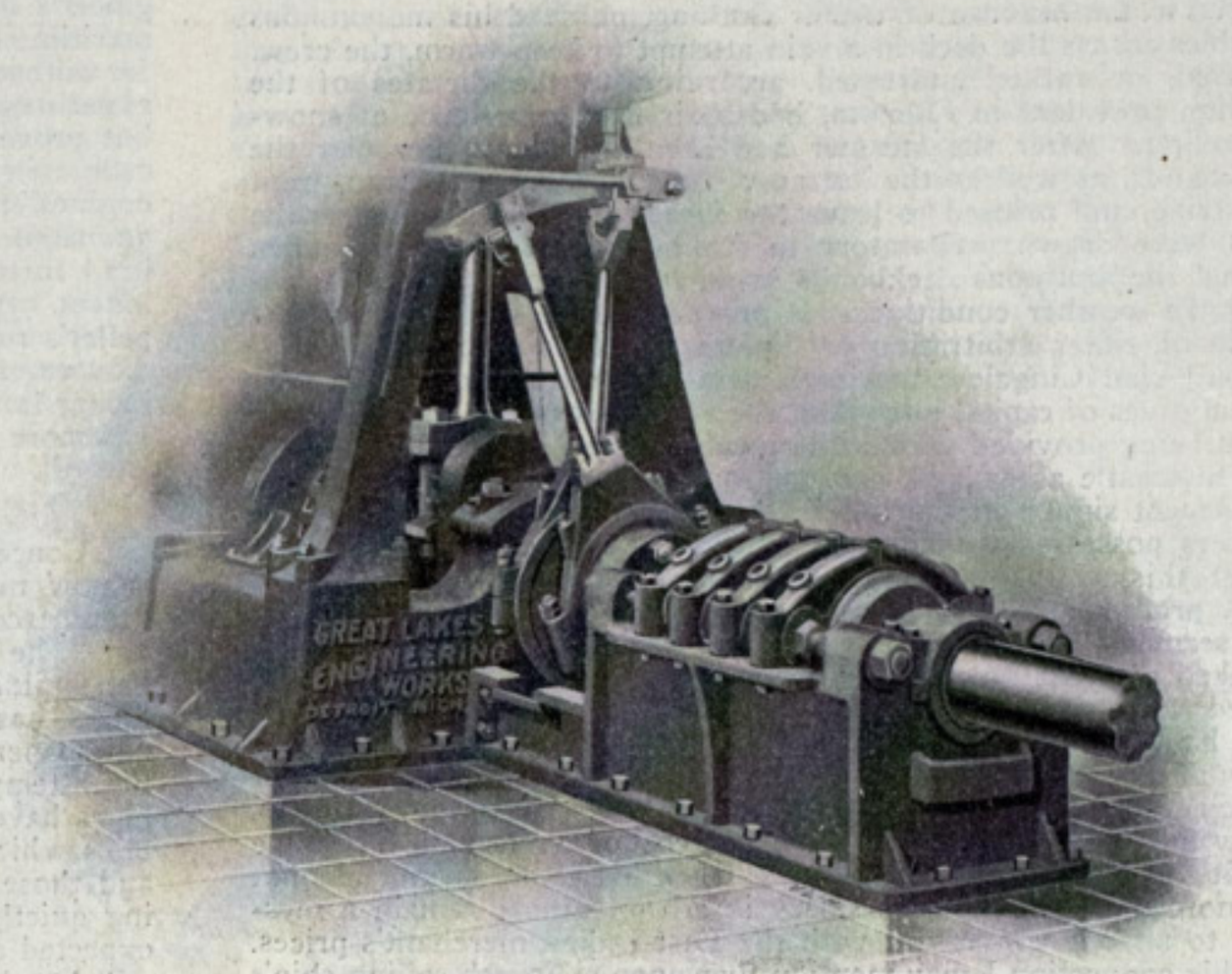
"I have no doubt whatever of the wisdom of a provision which shall make it possible to do this business through the employment of American ships. I think, however, that there is great danger that the passage of this bill in its present form would involve the government in serious difficulty and unwarranted expense. The number of American vessels available for shipment from the Atlantic coast to the Philippines is so small that a rigid requirement that shipments should be made in American vessels only would put the government entirely at the mercy of a very few individuals who would charge any price they wished. I think the same results can be accomplished and this danger avoided by changing the form of the bill, so that it will authorize a preference to American shipping, providing the charge made does not exceed the prices bid by the owners of foreign vessels more than a specific percentage. I should be in favor of increasing the preference to say 25 or 30 per cent."

It is proposed to have four of the 500-ft. two-story steel sheds on the Montreal wharves ready for use by August.

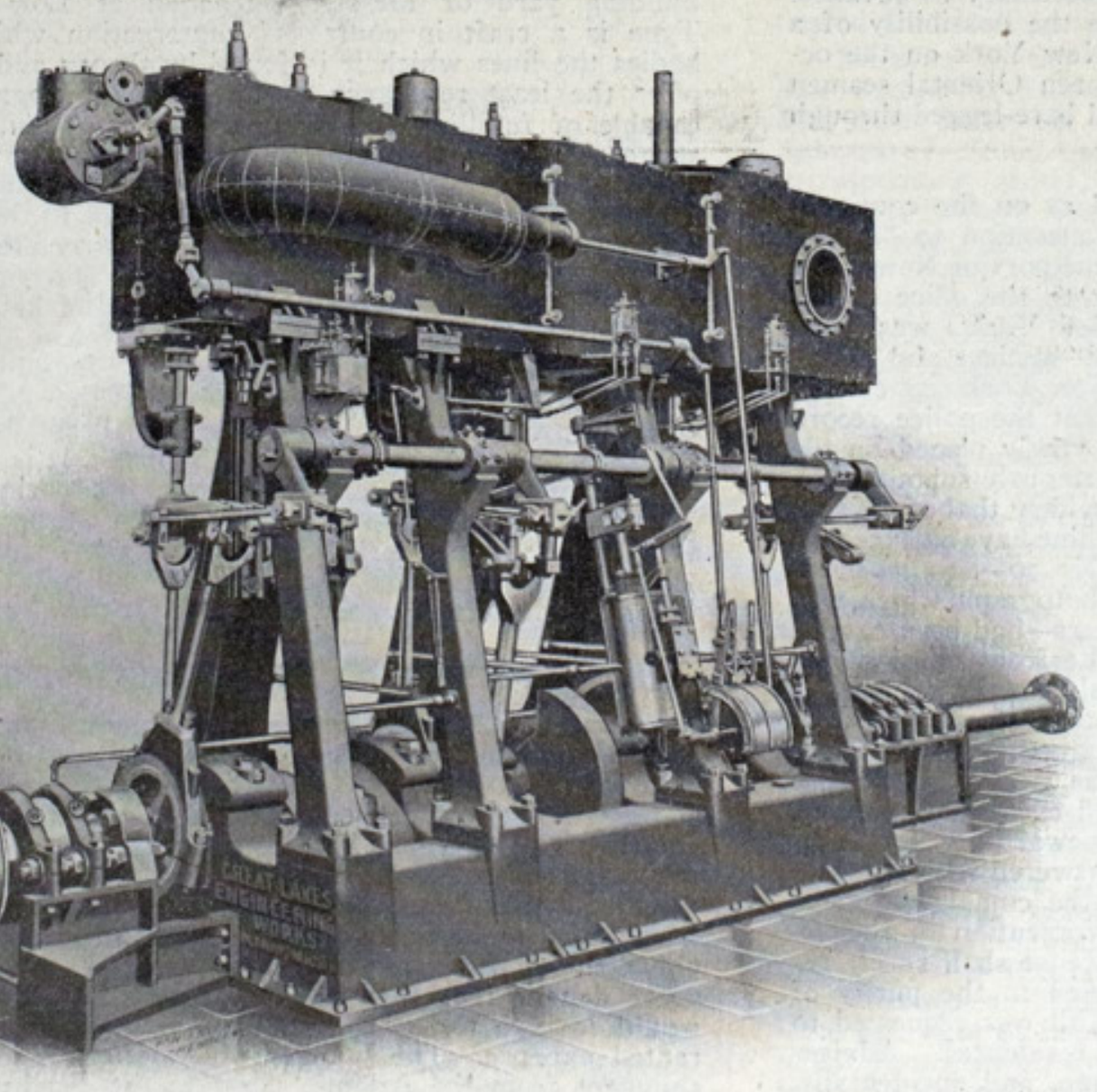
SELF-PROPELLING SUCTION DREDGE ATLANTIC.

In the last issue of the Marine Review, page 48, appeared a partial description (mostly from a hull standpoint) of a self-propelling single-screw suction dredge named Atlantic, built for the North American Dredging Co. and now in service in Galveston harbor. The dredge is 160 ft. 8 in. over all, 30 ft. beam, 14 ft. deep, and has a draught of 7 ft. 6 in. The hull was built by the New York Ship Building Co. of Camden, N. J., the machinery by the Great Lakes Engineering Works of Detroit, and the boilers, which are of Heine water-tube type, by the Risdon Iron Works of San Francisco. Of course the machinery is a very important part of a craft of this kind. We are indebted to the Great Lakes Engineering Works of Detroit for front view of the engines and also a view of the thrust bearing which appear on this page. The product of the Detroit works in this line is in use in all parts of the United States and as far away as the Philippines.

Engines of the Atlantic are of the three-crank triple-expansion type, with cylinders of 18, 30 and 48 in. diameter and 20 in. stroke, and are designed for 200 revolutions a minute with a working steam pressure of 200 lbs. They were built for Lloyds classification. The dredging pump is attached to the thrust bearing shown at the forward end in the illustration and which takes the thrust of the pump runner. When under way at sea the pump shaft is uncoupled and the propeller shaft coupled up. Both thrust bearings are attached to the engine bedplate. The high-pressure and intermediate cylinders are fitted with piston valves, the low-pressure with double ported slide valve. The low-pressure valve is fitted with balance ring and both this and the intermediate are fitted with counterbalance cylinders. Relief valves are fitted to top and bottom of all cylinders and to both receivers. Steam reversing gear of direct type is fitted and all reversing arms are slotted for adjusting cut-offs. Metallic packing is fitted to all rods and stems. The throttle is placed directly forward, because of the lead of the steam pipe and to allow of direct belting of the governor fitted as an emergency arrangement on all hydraulic dredging engines. The governor, not shown in the illustration, is of the ordinary centrifugal type. It is not used, of course, except when pumping. A tail-rod is fitted to low-pressure piston. All parts are made to standard guages and like parts are absolutely interchangeable. Piston rods, valve stems, piston valves, crank pins, crosshead pins, etc., are finished by grinding, and all taper fits are ground in. A few of the leading dimensions follow: Crank shaft, diameter, 8 9-16 in.; crank pins, diameter, 8¼ in.; crank pins, length, 9 in.; piston rods, diameter, 3¾ in.; connecting rods, upper neck, 3¾ in.; connecting rods, lower neck, 4¼ in.; connecting rods, length, 4 ft. 2 in.; crosshead pins, diameter, 4¼ in.; crosshead pins, length, 4⅜ in.; high-pressure piston valve, diameter, 9⅛ in.; high-pressure piston valve, travel, 4¾ in.; intermediate piston valve, diameter, 14⅛ in.; intermediate piston valve, travel, 6 in.; low-pressure valve, travel, 5¾ in.; Crosshead slippers, 12¼x13½ in.



Thrust Bearing Engines of Dredge Atlantic.



Engines of Self-Propelling Suction Dredge Atlantic.

Water circulation is provided in main journals and slides and in thrust collars. The crank boxes are of cast steel lined with white metal and the main journals, thrust shoes and crosshead pin boxes are also lined with white metal. The crosshead slippers are of phosphor bronze. The bed plate, housings, cylinders, cylinder covers, pistons in fact all principal castings, are of the builders special semi-steel with a guaranteed tensile strength of 35,000 lbs. per square inch.

The Great Lakes Engineering Works has made large additions to its plant during the past year, including the building and equipping of a complete new and modern ship yard, which is now in full operation, having a capacity greater than any yard on the great lakes and equal in capacity to any of the yards on the coast with two or three exceptions.

TESTIMONY OF EXPERTS.

The house committee on merchant marine and fisheries last week heard a number of ship owners and ship builders on the resolution of Representative Gardner of Massachusetts providing for the appointment of a commission to make a thorough investigation of the American merchant marine and report a plan for fostering it. Mr. F. T. Bowles, president of the Fore River Ship & Engine Co., said that at the present time there was no chance for American ship yards to build steamers for the foreign trade and that their work was confined to ships for the United States navy or for the coastwise trade. He suggested that representative merchants and public men who would be actuated by no interest except that of patriotism be included on the commission. Speaking for the ship owners, Alfred Winsor, president of the Boston Steamship Co. and the Boston Towboat Co., said that subsidies granted to foreign vessels had driven his company off the Atlantic ocean and that they had transferred their ships to the Pacific only to meet Japanese subsidized competition.

C. B. Orcutt, president of the Newport Ship Building & Dry Dock Co., said: "If anything is to be done it must be done quickly. There are many more ship yards than the business warrants, and there are no contracts in sight. If you are going to allow the ship yards to go into the hands of receivers, when you want to build ships there will be no yards in which to construct them."

Edwin S. Cramp, vice-president of William Cramp & Sons Ship & Engine Building Co. of Philadelphia, urged that a commission be appointed. He termed the merchant marine a "kindergarten for the United States navy."

A. R. Smith, superintendent of the Maritime Association of

New York, said his association was unanimous for the adoption of the bill, and presented resolutions to this effect adopted by the directors last week. Americans, he said, can invest in foreign vessels and earn a fair return for their money; if investment is made in American ships there is no return. A subsidy by the government, he said, would operate to the benefit not only of owners of vessels, but to the advantage of laborers and mechanics in the ship yards, because vessels would be built to compete for the world's trade.

Samuel S. Sewall of Bath, Me., spoke of the industry which had been handed down to him through his father from his grandfather. His family were the largest owners of American sailing vessels. "I don't expect to leave the business to my son," he said earnestly, "for as things are going now there will be no business to leave." His firm built its own ships, but a year ago it launched its last ship, which was for the coastwise trade. The yards were now shut down and there was no prospect of opening them, as the income from American ships amounted to about the same as that from government bonds.

SPLIT IN NEW YORK MARITIME ASSOCIATION.

It would appear as though the Maritime Association of the Port of New York ought to be an American body. Such does not, however, seem to be the case. A notice was posted on the door of the exchange recently calling a special meeting to pass a vote of censure on Mr. A. R. Smith, the association superintendent, for indorsing the passage of a law compelling the shipment of all United States government supplies by American vessels exclusively. When the special meeting convened the foreign element in the association, that is the representatives of foreign shipping companies, were in the majority, for the following resolution was adopted:

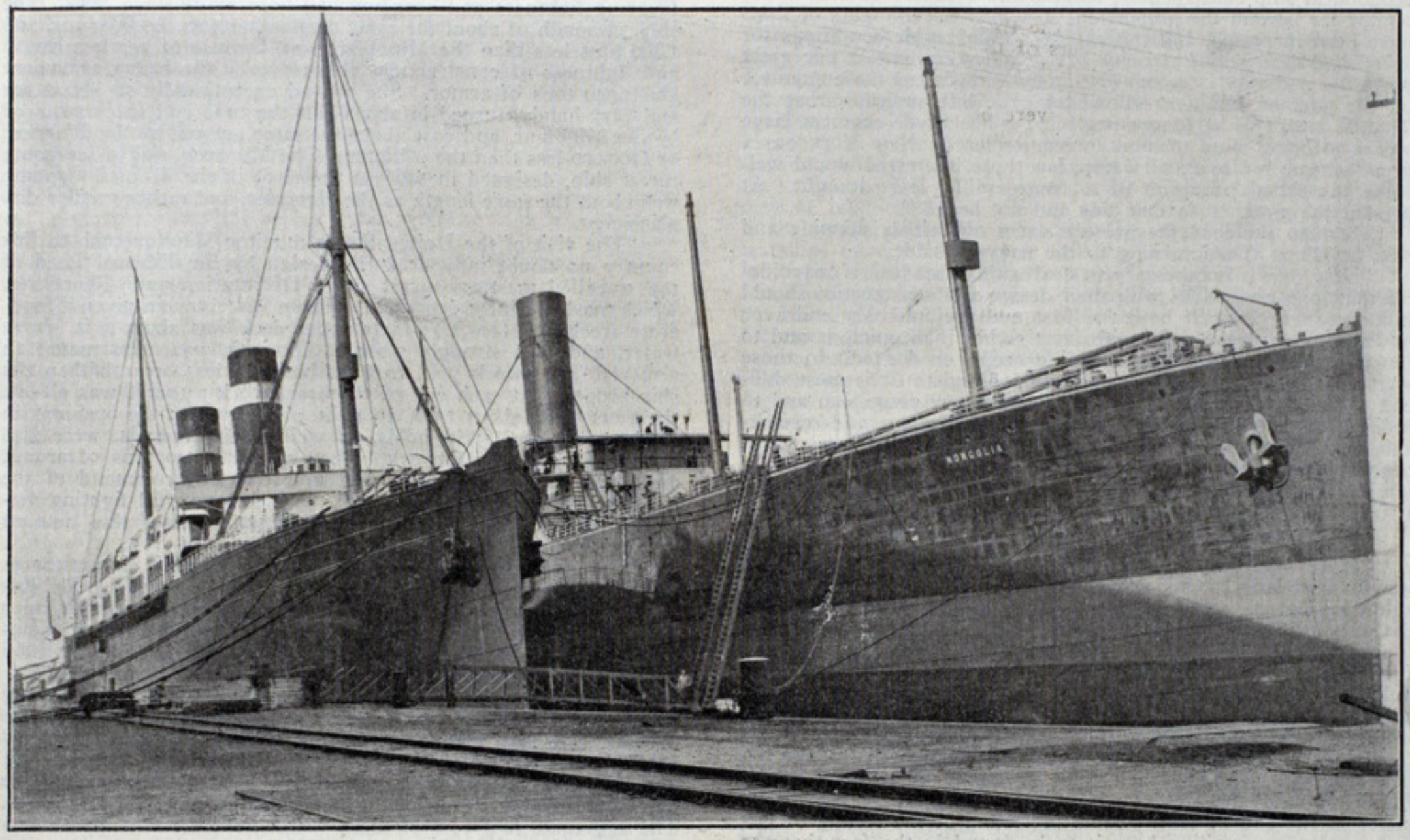
"That it is the sense of this meeting that the action of the board of directors endorsing senate bill No. 2,263 should be reconsidered and that the opinion of the members of the association generally should at all times be obtained before the association endorses any legislation liable to affect the interests of its members; and especially that the board will take no action in reference to senate bill No. 2,259 until a committee of seven, appointed for this purpose, has reported to a special meeting of this association."

One of these bills requires government supplies to be transported in American vessels; the other restricts the trade of the Philippines to American ships. Mr. Clement A. Griscom, Jr., a member of the association, when asked for an expression of opinion on the validity of the arguments of the foreign element against supporting American ships said:

"All I have to say in regard to the matter is that I had always supposed the Maritime Association of New York to be an American institution and in favor of such measures as would advance the interests of American shipping. I will be very much surprised and disappointed if I find such not to be the case."

Another member said: "It simply comes down to a question whether the association is American enough to stand for a policy which will benefit American shipping as a whole, although it undoubtedly is favorable to large shipping interests in this port. American ship owners are simply asking that, under the American protective system, which has made it much more expensive to build ships in the first place, and then to run them afterwards, their industry be put on equal terms with the others. This meeting has a lesson in it for Americans and that is that if they expect to do anything for the maritime interests of their own country they must organize and must adopt aggressive tactics as the English and Germans do."

It is pointed out as an indication of the lack of profitable cargoes that the Minnetonka and Minnewaska, the two 7,000-ton steamships that were built by the American Ship Building Co. at Cleveland for the American Navigation Co. of Duluth, have been laid up at the Morse Iron Works in Brooklyn and their steam pipes disconnected to avoid injury to the machinery by cold weather. These two steamers were taken to Montreal in sections and there joined together. They have had hard sledding in the ocean trade since they reached the coast. The tying up of these two vessels is of special interest in view of the assertion made by the opponents of the extension of the coastwise navigation laws to the Philippines that there are not enough American vessels available for that trade to take care of it. There are sufficient vessels for the trade if they are given a chance to thrive at it. But American vessels cost more to build and more to operate than foreign vessels and they confessedly cannot bid as low for carriage as foreign ships. That is the sum and substance of the whole issue. The fate of these two measures will be definitely settled in a few days at Washington.



Pacific Mail Liner Mongolia which underwent her Trial Trip this week.

[*Built by the New York Ship Building Co., Camden, N. Y.*

PACIFIC MAIL LINER MONGOLIA'S TRIAL.

The Pacific Mail liner Mongolia, built by the New York Ship Building Co., Camden, N. J., left this week on her trial trip, under command of William G. Randle, superintendent captain of the ship building company. The Mongolia is a five-deck steamship rigged as a four-masted schooner and is intended for service between the Pacific coast and China and Japan. She is 616 ft. between perpendiculars, 65 ft. beam and 51 ft. 3 in. deep. Her deadweight carrying capacity 14,000 tons. She will sail from New York to San Francisco shortly, and it is expected that she will make the trip without touching at any intermediate port.

The last issue of the Review contained a description of the Byram auxiliary rudder, patented by Theodore P. Byram of Detroit. In referring to the manufacture of this device, it was not the intention to convey the impression that the rudders could be made up and kept in stock. Of course the mechanism is such that it must be made to suit its surroundings in different vessels. Mr. Byram will welcome correspondence from anyone interested in this auxiliary rudder, and he says that from the standpoint of expense no one who thinks well of it will be deterred from introducing it.

BEGINNING OF IRONCLAD CONSTRUCTION.

The Conclusion of Sir William Henry White's Address, in which he Reviews his Active Connection with the British Navy—Predicts Ships up to 1,000 ft. in Length.

The Review in its issue of Jan. 7, brought the address of Sir William Henry White, as president of the British Institution of Civil Engineers, down through the portions in which he discussed twin versus triple screws and defended the water-tube boilers. It is now enabled to conclude the address of this extraordinary man with the general summary of his views:

"It seems to be accepted now," he said, "that a first-class port should have provision for ships up to 1,000 ft. in length, with 100 ft. in breadth at entrances and 33 to 34 ft. depth of water. Depth of water, as I have explained already, is a crying need for economical ship construction; lengths and breadths have been extended far beyond the proportions in which the draughts of ships have been increased, and this involves unfavorable conditions for speed and deadweight capacity. It would seem that at our great ports the necessity is recognized and the report of the committee on the port of London, followed by the bill, indicates that the Thames is not to be longer neglected. The Clyde requires large works to bring it up to modern requirements. New York has a great scheme for 40 ft. of water; but those interested would welcome the actual provision of a considerably less draught. At present the pinch is on that side and not here."

He then sketched the present status of British shipping and ship building. Then turning to the navy he said:

"Now that it is necessary to deal with warships it is unavoidable that long connection with their design and construction should influence my views of both the past and present. My endeavor however, is to deal chiefly with facts rather than opinions and to illustrate progress without assigning credit or discredit to those who have been responsible for warship designs. It is most difficult to deal with the great mass of facts in my possession and to indicate the more important steps in the continuous and remarkable developments which have taken place since the Warrior was begun in 1859. Probably the simplest and most useful way of attaining that object will be to give particulars of typical ships constructed at different periods and to make brief comments thereon.

FRANCE LED IN IRONCLADS AT THE BEGINNING.

"It has been indicated that in 1859 France had a considerable lead in ironclads, having acted decisively and on a carefully-considered program, while in this country controversies raged and the responsible authorities hesitated. After the effort of ordering four iron-built ironclads in that year there came a pause and further action was not taken until 1861. Then six more iron-hulled armored ships were ordered and five wooden line-of-battle ships were turned into ironclads of the French pattern. Eleven ironclads were thus added to the royal navy, making a total of fifteen under construction. The French immediately ordered ten new ironclads, bringing their total to twenty of which three or four were ready for service while we had only the Warrior completed at the end of 1861. Some indication of the feeling of uncertainty still prevailing here is to be found in the fact that the navy estimates for 1861-2 contained a vote for nearly a million sterling to replenish the stock of ship building timber—said to be the largest vote ever passed for that service. This was subsequent to the demonstration of the great superiority of iron hulls and the commencement of ten iron-built ironclads. The new program showed some interesting features. A vessel of the dimensions of the Warrior (the Achilles) was begun at Chatham dockyard, marking the commencement of iron ship building in these establishments. The weak features, due to unarmored ends in the Warrior were removed by extending the armor from the central battery to the bow and stern, up to the height of the main deck. Steering gear and buoyancy were thus protected, and the displacement costs were increased. Thus the 'belt and battery' system came into use for first-class British ships; the French having used it for two ships built in 1859, with double-storied central batteries. Three of the new ships were made 20 ft. longer than the Warrior, about 1,400 tons greater displacement, and their cost increased to nearly £500,000—about 25 per cent. above that of the Warrior. The protection of two was complete, as in La Gloire; the third was armored on the belt and battery system. These were by far the largest and most costly warships of the period. Their protection and speed were about equal to that of the Warrior. They had large sail-spreads and fine masts. For a quarter of a century they remained on active service, splendid specimens of naval architecture, but indifferent fighting machines.

"Sir Edward Reed, who had submitted plans to the admiralty about the period when these large vessels were building, for giving armor protection to vessels of the smaller classes, was given the opportunity of practically applying his idea, and in 1863 was appointed chief constructor of the navy. He held that office for seven years, retiring in 1870. Sir Nathaniel Barnaby was responsible for the designs of British ships for the following fifteen years, retiring through ill-health in September, 1885, after a connection with the constructive department of thirty-one years. My work as director of naval construction and assistant controller of the navy extended from October, 1885, to the end of January, 1902. Three naval architects, therefore, have carried on the designs of British warships for thirty-nine years; and of that period I served at the admiralty—with a break of two-and-a-half years when engaged at Elswick—nearly thirty-five years. It is possible, therefore, for me to speak with the most intimate and direct knowledge of all that has happened in our warship construction since June, 1867. In doing so, it will be convenient to describe what occurred during the respective periods of office of my two predecessors and myself.

FEATURES OF THE BROADSIDE TYPE.

"The Bellerophon, of 1863, represents the great features of the broadside type which Sir Edward Reed introduced for sea-going ironclads. These features may be briefly summarized. The armament consisted of ten heavy guns of 9-in. caliber, each weighing 12 tons, mounted on the main deck (five on each side) in a central battery less than 100 ft. long—or less than half the length of the battery in the Warrior. At the bow was a short-armored battery containing two 7-in. 6½-ton guns.

"The Hercules, completed about the end of 1868, and her successor, the Sultan, represent the finest examples of Sir Edward Reed's broadside ships. She is 25 ft. longer, and about 1,400 tons greater displacement than the Bellerophon. Many improvements favoring lightness and economy had been made since 1859. The ship, although of about the same displacement as the Warrior, and 1,400 tons less than the Minotaur, was, because of her less length and lightness of construction, able to carry the heavy armament and 1,340 tons of armor. She proved exceptionally steady at sea and very handy, turned in about half the time and space required by the Minotaur, and cost about the same amount as the Warrior, or £100,000 less than the Minotaur. The Monarch, rigged sea-going turret ship, designed in 1866 as the rival of the ill-fated Captain, was about the same length as the Hercules, and rather smaller displacement.

"The visit of the United States monitor Miantonomoh to this country no doubt influenced the design by Sir Edward Reed of the so-called mastless turret ships Devastation and Thunderer, which marked a new departure. These vessels were given a moderate freeboard (10 ft.); their upper deck was about 3 ft. above water, and was strongly plated. Above it was constructed an armored breastwork 7 ft. to 8 ft. high, of less breadth than the ship proper. At each end of the breastwork a turret was placed, the guns being about 13 ft. to 14 ft. above water; the openings to engine-room and stoke-holds, as well as the funnels, were also protected by the breastwork. They carried 2,540 tons of armor, and their heavy turret-guns had uninterrupted command of the horizon. Undoubtedly they were the most powerful fighting machines of that day; the cost was £360,000, and of this amount armor represented a very large sum.

"The result of seven years' work under difficult circumstances was, therefore, an advance on the ironclads designed by Sir Edward Reed from 7,250 to 9,300 tons in displacement, from 6 in. to 12 in. or 14 in. in armor, in guns from 12 tons to 35 tons; the number of guns had diminished from twelve to four, and the abolition of sail-power removed hindrances to horizontal training.

"An examination of the figures for new construction during the seven years Sir Edward Reed held office shows that from his designs were laid down twenty-five ironclads, two small armored gun-vessels, twenty cruisers, corvettes and sloops, twenty-eight gun-vessels and gunboats for sea service, and twenty coast-service gunboats; making a grand total of ninety-five vessels of all classes. The aggregate first cost of these vessels, exclusive of armaments and stores, was under 10,000,000 sterling.

WARSHIP BUILDING FROM 1870 TO 1885.

"After the loss of the Captain by capsizing under sail in the Bay of Biscay, in September, 1870, a powerful committee on designs was appointed in 1871, with Lord Dufferin as chairman; its members may be said to have included the most eminent representatives of science, mechanical engineering and ship building, besides naval officers of high standing. The conclusions of the committee were, on the whole, most reassuring, although they involved steps to give increased stiffness, by means of ballast, to certain types of ironclads then completing, and the addition of unarmored superstructures to give greater range of stability to the Devastation and Thunderer. Naturally, these changes provoked controversy in various directions; the interest in these is now dead. The most important result in its influence on future design was the recommendation of the committee of the 'central-citadel' type of turret ship, and the consequent preparation by Sir Nathaniel Barnaby of the design for the Inflexible in 1873. The Inflexible was given the standard length for battleships—320 ft.—and the standard speed—14 knots. Her breadth was 75 ft., which was about 20 per cent. in excess of the broadest of her predecessors. Her free-board was less than that of the Devastation, being intended to be 9½ ft. Her armored citadel amidships had an extreme length of 110 ft. only, and extended from 9½ ft. above water to 6½ ft. below. The ship was commissioned in 1881, proved of great service next year in the bombardment of Alexandria, and continued on the navy list until this year, when she was sold for breaking up.

"A special committee was appointed in 1876 to consider statements made by Sir Edward Reed respecting the probable instability and dangerous condition of the ship when her unarmored ends were damaged in action. The committee did not agree with this opinion, and the central citadel system received further extensions. Of course, this was largely a matter of authority and opinion. Long afterwards, at the battle of the Yalu, two Chinese ironclads, in which the unarmored ends were exaggerated, in comparison with those of the Inflexible, while they were inferior to her in stiffness and in arrangements for maintaining buoyancy and stability when the ends were riddled, not merely bore the brunt of the fighting, but actually followed up the Japanese fleet at the close of the day. Admiral Ito, who commanded the Japanese that day, had done all he desired, by the practical destruction of the Chinese naval force, and took no extra risks. This fact ap-

pears to support the opinion of the committee and the action of the admiralty at that time. The last two rigged broadside ironclads of the royal navy were also laid down in 1873 from Sir Nathaniel Barnaby's designs.

"The principle of 'concentration' in armor and armament received its extreme illustration in the Inflexible, and was not abandoned for some years. But it had its weakness; and when the French started their new naval program in 1872, after the conclusion of the war with Germany, they designed battleships which were intended to have superior fighting qualities at sea. The moderate freeboard of our turret ships and small height of guns above water resulted, especially in ships armed *en echelon*, in serious interference with fighting efficiency on the open sea in rough water, although it was well adapted for ordinary Mediterranean weather or smooth water. The French, with their usual clear sightedness, designed high-sided ships with a few heavy guns mounted high above water in armored barbettes, and associated with these a large number of light guns mounted between decks on the broadside without armor protection. In short, they combined principal and secondary armaments in a type which had undoubted claims to greater efficiency for sea-fighting in rough water than our turret ships could claim. The light guns also gave the power of rapid fire in combination with the necessarily slower fire of the heavy guns; whereas in our ships the great horizontal command of the turret guns made it practically impossible to have a powerful and efficient secondary armament. In armor protection our ships were immensely superior, as the French were content with a narrow water-line belt of armor running from bow to stern, and rising only 2 ft. to 3 ft. above the load-line, a protective deck closing in the hold space at the level of the top of the belt. Above this the sides were unarmored.

"This action on the part of French designers necessarily caused a change of practice here, and in 1879 the first vessel of the Admiral class was designed, her construction being commenced in 1880. Although 10 ft. broader and 55 ft. shorter than the Warrior, and of about 800 tons greater displacement, the Admiral class are driven as easily as the Warrior was up to her maximum speed of 14.35 knots, and they have, besides, the power of reaching nearly 16 knots without serious 'forcing' of the boilers. This is due partly to a good form, and partly to greater efficiency of the more modern twin-screw engine. It will be observed that after twenty years of adherence to a speed of about 14 knots for ironclad battleships, a considerable step was made in the Admiral class. Another striking feature of advance is the introduction of locomotive torpedoes, while the use of quick-firing guns, 6-pounders and 3-pounders, though primarily due to the desire to provide defense against torpedo-boat attacks, was also an important element of offense in action against ships in which armor protection was limited in area and many light guns were placed in unprotected positions. Incidentally, it is interesting to note that not merely had Whitehead's invention of the locomotive torpedo added to the offensive powers of ships, but had brought into existence the torpedo boat. The first had been built by Thornycroft in 1873, for the Norwegian navy, and in 1877 the first British torpedo boat, the Lightning, was built by the same firm. She was 85 ft. long and of 18 knots to 19 knots maximum speed, with a displacement of 27 tons. No one then anticipated to what an extent the torpedo flotilla would grow in a quarter of a century, or what varieties of types it would include, thanks to the efforts of naval designers and the demands of foreign navies.

"The Victoria and Sanspareil of 1885 were Sir Nathaniel Barnaby's last battleships, and in many respects noteworthy. They had low freeboard forward and a single turret, containing two 110-ton breechloading guns, with their axes about 16 ft. above water. Abaft the turret the hull was built a story higher; and in this portion of the ship were mounted twelve 6-in. guns, while, on the upper deck aft, one 10-in. gun was carried as stern-chaser, with shield protection only.

THE DESIGN OF CRUISERS AND SMALL VESSELS.

"On the side of cruisers and small vessels very moderate advances were made between 1870 and 1882. In 1883-4 I designed and built at Elswick for the Japanese navy two protected cruisers exceeding all existing cruisers in speed and armament, while resembling the Mersey class in protection. These vessels were completed in 1885, and have seen much war service since. The Nanura had the first fighting in the war with China—both ships were at the Yalu—and Admiral Ito, who commanded, wrote to me after the battle to express his complete satisfaction with their performance then and throughout the war. These two vessels have been almost continuously at work since their construction, and Messrs. Hawthorn Leslie, who made the engines, must be well contented with their work.

"Armored cruisers are distinguished from protected in having vertical side-armor and horizontal decks instead of curved decks from side to side. The Imperieuse and Warspite, designed in 1881 by Sir Nathaniel Barnaby, are now included in this class, although they were at first regarded rather as second-class battleships. The Orlando class, designed in 1885, are later examples. The vessels have been continuously employed, and have excellent reputations for behavior at sea. Although now out-classed by modern cruisers, they were admirable vessels in their day. One other vessel designed by Sir Nathaniel Barnaby ought to be mentioned. The Polyphemus, torpedo-ram, was begun in 1878, completed in 1882, and stands alone. Apart from the failure of the locomotive boilers, the vessel was a complete success. Mr. Watts, now director of naval construction, was in charge of details of the design, and watched the construction throughout at Chatham. I had charge, under Sir Nathaniel Barnaby, at the admiralty. No pains were spared to secure the results reached, and all that was promised was fulfilled. But my personal opinion always was that this type was purely experimental, and not likely to be generally adopted. The practical absence of gun-armament and limited sea-keeping qualities were unsatisfactory features. The cost was £226,000.

"From 1870 to 1885 Sir Nathaniel Barnaby was responsible for the designs of twenty-eight ironclads, six armored cruisers (Orlando class), twenty-seven protected and partially-protected cruisers, and 129 unarmored armed vessels of all classes; a grand total of one hundred and ninety. The aggregate first cost of these vessels was about 27,000,000 sterling. When he resigned, in consequence of ill-health, the Northbrook program had been recently commenced, and two battleships and six armored cruisers included under it were in an early stage of construction. He had well-earned the rest which he has since enjoyed.

WARSHIP-BUILDING FROM 1885 TO 1903.

"It is with considerable diffidence that I approach this period of naval construction and speak of the character and magnitude of the extensions made in the royal navy, because there is a danger of appearing to appraise or commend work in which, from my official position, I may have taken a prominent part. Trusting to your kindness, an attempt will be made, however, to set forth the essential facts briefly. On other occasions I have dealt with sections of the subject, and it will be my endeavor to avoid repetition of what may be read elsewhere. Many new departures have been made in the armor, armament, types, speeds, and propelling apparatus of warships during this period. Mechanical appliances have been multiplied and electrical power largely extended. The task of the naval architect has been one of increasing difficulty and coomplexity. Naval gunnery has been revolutionized. Guns have been greatly increased in length and weight in proportion to their calibers, their structures have been improved, better propellants introduced, and higher velocities and energies obtained. Rapidity in rate of loading has been greatly increased. With this greater rapidity of fire comes the question of larger supplies of ammunition, and greater weight and space for storage. Appliances for the rapid transport of ammunition also become essential, as in defect of adequate supplies there can be no utilization of the improvements in guns and mountings. In many instances one has seen elaborate systems for transports, either altogether unprotected or inadequately protected at some vital part. No problem in connection with armaments requires more care than that of adequate and protected supplies of ammunition.

"These changes in guns and mountings have greatly influenced the rate of construction for warships, and seriously affected cost as well as progress. The complaint is not a new one, but it is no less true. So long a time is frequently occupied by committees and sub-committees in working out details of new guns and ammunition before actual patterns are finally settled and manufacture begins, that in many instances, in my experience, ships have had to wait for guns, and in others to have considerable modifications made Experience in the royal navy between 1879 and 1885 was most trying to those of us who had to be responsible for new designs. In one instance, important ironclads were laid down and considerably advanced before the principal armament was decided. The design was based on provisional estimates for weights of guns and ammunition, and for muzzle velocities. These provisional estimates were so far departed from, however, in the final design for the guns, that the draught and depth of the ships had to be increased a foot, and the armor lifted the same amount. Fortunately, the discovery was made at a time when the work was not too far advanced to permit of the alteration being made at moderate cost; but rapid progress with the ships was impossible under such conditions, and confidence in the results was shaken. In more recent times there has been a distinct improvement, and I have known cases where guns have been waiting for ships. But there appears to be some possibility even now of improvement in the matter of settling new types of guns; and in my judgment that settlement should always be arrived at for both guns and mountings before the work of building a modern sea-ship is begun, if rapidity and economy are to be ensured.

"The manufacture of armor as well as guns has been greatly improved. At present the problem is, How to increase the efficiency of armor-piercing projectiles against armor in which chromium, as well as nickel, is alloyed with steel and subjected to special treatment? It is strange to recollect that in 1887-8 high authorities were disposed to think that armored ships would cease to be built. Instead, the use of armor has been greatly extended in cruisers, as well as in battleships, and the two classes have drawn nearer than ever, differing only in the nature of their bow and stern chase guns and in the thicknesses of their armor.

BEGINNING OF THE ERA OF LARGE NAVAL PROGRAMS.

"Before giving particulars of a few typical ships of the period under review, it may be proper to point out that in one important respect our naval ship building has differed in character from that of earlier periods. From 1888 onward we have had a succession of large programs of construction, embracing large numbers of ships of all types required to constitute a modern fleet, with its great variety of services. The naval defense act of 1889 was framed to provide a modern fleet, complete in all its parts, and did so at a cost of about £22,500,000 for seventy ships. Since that date there has been a succession of programs, each of a progressive nature, and equally effective with the naval defense act, although not embodied in an act of parliament or published. My conviction is that the preferable course, provided there is a definite program, is to refrain

from making it known, as possible rivals are then left in ignorance of our intentions, and with our enormous ship building and gun-making resources we can always insure keeping the lead in finished ships, even if we start somewhat later. I am aware of the progress made abroad in accelerating construction, and that statements have been made that our former superiority has disappeared, or nearly so. But these statements are not well-founded, and anyone who cares to inquire can ascertain that this is so. The latest illustration of the contrary view is to be found in the lead we have taken in armored cruisers, although we did not start until foreign types had been settled and construction had begun. Waiting, under these circumstances, is obviously a proper policy in order to insure superiority for our vessels of a particular class, always provided that a start is made in proper time to secure earlier completion. The task of framing a naval program is no light one, and, after many experiences of the kind, I may say that it became no easier by repetition. The 'making of a modern fleet,' as I have said elsewhere, involves the following principal steps:

"1. There must be a determination by competent authority of the types of ships to be built, and the numbers in each type. This involves a decision respecting the offensive and defensive powers, the speed, and coal supply to be provided in each type.

"2. Designs must be prepared fulfilling the specified conditions.

"3. Estimates of total cost, and of the incidence of expenditure on each year of the period of construction, must be made.

"4. The orders for ships, machinery, and armaments must be carefully allocated, so that the work of construction may be completed within the stipulated period.

"The first step is undoubtedly the most important. In default of actual experience in warfare with modern ships, there are necessarily wide divergences of opinion regarding the relative values of different types. There are advocates of large ships possessing great individual fighting power; of small swift ships built in large numbers for a given expenditure; of torpedo vessels pure and simple; of armored rams; and many other systems of construction. Very often a particular course is advocated as suitable for exclusive adoption in disregard of the principle, sanctioned by the universal experience of all navies, that in a fleet there must be many types specialized and adapted to different services, mutually supplementing and supporting one another.

"The board of admiralty is the final and responsible authority which has to decide what qualities of offense, defense, speed, and power of keeping the sea shall be embodied in the design of each of British ships. This task naturally devolves principally upon the naval members, whose high rank in the service, long experience afloat, and special information, make them peculiarly qualified for their duty when acting as a 'Committee on Designs.' In dealing with the numerous and difficult problems presented to them when framing a new program, the admiralty has many advantages. Under its direction is the largest war fleet in the world. From the naval service valuable reports and suggestions are constantly being received, embracing particulars of the performances of ships in commission, proposals for improvements in future designs, records of experiments and results of experiments.

THE TRIPLE ALLIANCE FOR AN EFFECTIVE NAVY.

"So far as one can judge, the three classes required to deal with these problems efficiently must be: The politician, who knows the policy of the cabinet of which he is a member; the naval officer, who is responsible for the strategy and tactics of the fleet; and the naval architect, who designs the ships to fulfill the conditions laid down. Each has his distinct duty and responsibility, and the naval officer must not trench upon the province of the naval architect, nor the latter pose as an authority on naval strategy or tactics. Each may know much of the other's special department, and there may be mutual assistance, but their duties are distinct. The amateur naval architect is as objectionable and dangerous as the amateur strategist. In my long experience at the admiralty my relations with naval officers have always been most cordial, and my responsibility has been uniformly respected; so that I can venture to say what has been said.

"Under present conditions, with great public interest attaching to all matters connected with the royal navy, there is no small danger of these fundamental considerations being overlooked or ignored. That product of modern times, the 'naval expert,' has every confidence in his capability to settle policy, strategy, tactics, and ship design. His criticisms are sweeping, and his conclusions and proposals must not be questioned. If he has a weakness, it is a belief in the doctrine that 'these things are done better abroad,' and a conviction that entry into the public service impairs the ability of any man. It is one of the conditions which a public servant has to accept, that anonymous writers of this class shall deal with his professional work, and inform the public of its shortcomings. Sometimes one is diposed to 'turn and rend' the offender, especially if he drops the veil of anonymity; but, on the whole, silence is undoubtedly the wiser course. As typical battleships of the period now under review the Royal Sovereign class of 1889 may first be taken. The implacable of 1896 represents a modification in some particulars of the Majestic class of 1894. She is 70 ft. longer and the same beam as the Royal Sovereign—viz., 400 ft. by 75 ft.

"The King Edward VII. class, my last design of battleship, date from 1901. Their length is 425 ft.; breadth, 78 ft.; displacement, 16,350 tons. They have a combination of water-tube and cylindrical boilers, developing 18,000 H. P., and the estimated speed is 18.5 knots. They have a citadel resembling that of the Implacable, but from the lower to the main deck the thickness is 8 in. The barbettes are similar to those of the Implacable and each contain two 12-in. guns mounted on turntables, with strong armored shields. On the main deck between the barbettes there is a central battery, with 7-in. armor on its sides, containing ten 6-in. quick-firing guns. On the upper deck are four 9.2-in. 24-ton guns mounted on four separate revolving armored shields or 'gun-houses.' There are five vessels of this class building, representing in the aggregate about 7,500,000 sterling. They are the largest battleships yet added to the navy, but are of very moderate size as compared with a large number of existing merchant ships, for which details have been given.

"Armored cruisers of the modern type date in the royal navy from 1896, when the Cressy class was designed. They resemble battleships in their secondary armament and the distribution of their hull armor, but they carry nothing heavier than two 9.2-in. bow and stern chase guns, instead of the four 12-in. guns, and have no strong armored barbettes. The Drake class are the largest yet built. They were designed in 1898-9, and there are four vessels of the class. Their length is 500 ft.; breadth, 71 ft.; displacement, 14,100 tons. The cost is rather more than £1,000,000. The Cressy class is smaller, 440 ft. long and 12,000 tons, wood-sheathed and coppered. They steam 21½ knots with natural draft. In protection they resemble the Drake class, and in armament are a little inferior, carrying four 6-in. and four 12-pounders less. The cost is about £780,000.

"The County class is a numerous one, of the same length as the Cressy as originally designed, steaming 23 knots, but armed with fourteen 6-in. guns and ten 12-pounders, and having 4-in. instead of 6-in. armor. In later vessels 7.5-in. guns have been introduced, and the armor made 6-in., with some increase in length and displacement, and a decrease in speed. It is particularly interesting to recollect that when, in 1888, I designed the Blake and Blenheim cruisers of 9,000 tons, they were described as 'monsters,' and considered to go beyond proper limits of size.

AUXILIARY VESSELS AND SUBMARINES.

"In modern fleets there is a tendency to revert to an old practice, and to associate 'tenders' with the fighting ships, or to build ships for special purposes with moderate fighting power. The Hecla, a merchant steamer, was converted into a torpedo-boat carrier and repairing ship about fifteen years ago, and carried a light armament. In 1887 I designed the Vulcan torpedo depot ship for the royal navy, in all essentials repeating a design I had prepared at Elswick four years before. She was a protected cruiser of high speed and moderate armament; besides being a torpedo-boat carrier and depot, she had powerful hydraulic cranes for lifting boats of 18 tons weight, and could carry ten of these high above water. In addition she had numerous machines for effecting repairs. Recently a large cargo steamer, the Assistance, has been fitted up as a floating factory to accompany the fleet. The United States navy had a similar ship, but much smaller, with them during the war with Spain. Water-tank vessels have also been constructed to carry fresh water for fleets, and there is a considerable weight of opinion in favor of specially-constructed fleet colliers, ammunition ships, and store ships.

"The British admiralty took no action to introduce submarine vessels into the royal navy until the year 1901, although many such vessels had been built in France and a few for the United States navy. Arrangements were then made with Messrs. Vickers, Maxim & Co., who had acquired the rights of building boats on the Holland principle, similar to those which had given good results in America, and five submarine vessels were ordered for the royal navy. These have been completed and are on service. Since that time four larger and improved vessels have been ordered, and the current navy estimates provide for ten more. This fact indicates that the earlier boats have given satisfaction, although no official reports are available.

"In this institution we are chiefly interested in the technical problems incidental to the design and construction of submarines. These problems have been long studied and are well understood. It has always been possible to produce vessels of this class, if naval authorities required them. In the development of details, upon which success largely depends, experience is of the highest importance. Mr. Holland has unrivalled personal experience and great mechanical skill. Consequently, my advice to the admiralty was to avail ourselves of the opportunity to secure that experience, and by concentrating orders in the hands of an eminent firm many advantages are gained, while secrecy is maintained. Improvements have been, and will be, made under the guidance of naval officers who try and use the vessels, as well as by the builders; and already it would appear that we stand well as to types compared with France, although inferior in numbers.

"Excluding destroyers, my responsibility for designs and construction included forty-three battleships, twenty-six armored cruisers, twenty-one first-class protected cruisers, forty-eight second-class, thirty-three third-class and seventy-four unarmored or unprotected vessels. The total represents 245 vessels, with an aggregate value of about 80 million sterling. The figures given for costs throughout this address are exclusive of armaments, ammunition, and reserves, for which the naval architect is, of course, not responsible. Including these items, the first cost to the nation of the 245 ships ready for service must be at least 100 million sterling.

BRITISH MARITIME SUPREMACY ESSENTIAL.

"It is an unquestioned article of the national faith that the maintenance of British maritime supremacy is essential not merely to the well being but to the existence of the empire. This is no new doctrine; it was well understood and acted upon centuries ago. At times it may have been obscured, or there may have been

neglect of adequate measures to insure supremacy, and a careless confidence that we could live upon the reputation of the past. No such mood now possesses the nation. The events of the last fifteen years prove that, at all costs, there is a resolve to maintain our position as the greatest naval power. Not as a menace to other nations, but as a guarantee of peace on the high seas, the free flow of commerce throughout the world, and the uninterrupted communication between the widely-scattered parts of our great empire. The navy—meaning the mercantile as well as the war fleet—is the essential bond of union between the mother country, the colonies, and possessions beyond the seas—the common asset of all. No better routes than the ocean offers can be found for the peaceful intercourse between us and our brethren, which is the great object of our aspirations, and our established policy is to hold these ocean highways open to all nations, claiming no monopoly or exclusive rights. Our war-fleets are the guardians, our merchant ships the messengers of peace. As was well said by the three admirals in 1888: 'No other nation has any such interest in the maintenance of an undoubted superiority at sea as has England, whose seaboard is her frontier. England ranks among the great powers of the world by virtue of the naval position she has acquired in the past, and which has never been seriously challenged since the close of the last great war. The defeat of her navy means to her the loss of India and her colonies, and of her place among the nations.' Such a disaster can never happen so long as our national spirit is maintained.

"The Roman empire was far-reaching, and its rulers well understood the supreme value of good communications. In this outlying portion of the empire, far farther removed from the centre under then existing conditions than our most distant possessions are now from the mother country, the great roads remain as monuments to the imperial conception. The ocean furnishes our roads, with the cheapest and most convenient transport, ready made. Ship builders and engineers have provided the means of locomotion and brought the Antipodes within easy reach, while the Atlantic passage is so small an enterprise that it is no more regarded than was a journey to Inverness in the last century. We all share the wish expressed recently by the president of the Iron and Steel Institute (Mr. Carnegie), that our relations with kinsfolk in the United States should be more intimate and cordial, but we do not agree that it is unfortunate to have an ocean between our shores instead of prairies. It is an absolute fact in modern times that 'the seas but join the nations they divide.' We need no better links of communication than those which have been created and are still being improved; only never let it be forgotten that it is the 'navy whereon, under the good providence of God, the safety, honor and welfare of this kingdom most chiefly do depend.'"

Capt. R. Gillies, for many years engaged in lake navigation, died at Port Colborne, Ont., on Thursday last.

EXHIBITION OF PLEASURE BOATS.

The first American exhibition of pleasure boats, moved by screw propellers and measuring from 15 to 50 ft. in length, will be opened on Feb. 8 in the Herald Square exhibition hall, New York, under the auspices of the National Motor Boat association. Dr. Robert Taylor is the director of the exhibition. Among the exhibitors and others interested are the Standard Engine Co.; Fairfield Motor Co.; Isham Motor Co.; Truscott Boat Co.; Gas Engine & Power Co.; Hasbrouck Motor Co.; Palmer Bros.; Cushman Motor Co.; Carley Life Float Co.; Fairbanks, Morse & Co.; Richardson Engineering Co.; Yacht Gas Engine & Launch Co.; Camden Anchor Co.; Whitestone Boat Co.; Clifton Motor Co.; Newbury & Dunham; Victor Metals Co.; Lamb Boat & Engine Co.; Babcock, Atwood & Bowen; Smith & Mabley; Lozier Co.; Old Town Maine Boat Co.; Fairbanks Co.; Matthews Boat Co.; Racine Boat M'fg. Co., Engelhardt Collapsible Life Boat; Robert Jacob; Morrison Life Belt Co.; Lane & De Groot; National M'fg. Co.; Western Engine Co.; J. H. Perrine; Reliance Kerosene Motor Co.; Stamford Motor Co.; A. J. Tower & Co.; Marblehead Yacht Yard; Chas. D. Durkee & Co.; Pneumatic Mattress & Cushion Co.

The maximum boiler horse power in central power stations is only attained during a few hours of the day. During the greater part of the day the capacity required is much less than this maximum. On this account it has been found economical and practical to design the boilers and chimneys of ample capacity for this load and to force them above and up to the maximum by means of mechanical draft. This is applied with equal success to old and new plants. In the new power station of the Denver Tramway Power Co., Denver, Colo., mechanical draft is used as an auxiliary to the natural draft provided by a chimney 240 ft. high. Artificial draft is furnished by three Sturtevant electrically-driven steel plate fans. The boiler capacity of the plant is approximately 6,000 H. P.

Mr. Rogers, chief engineer and superintendent of hulls for the Union Steamboat Line and the Lehigh Valley Transportation Co., says in a letter to D. E. Lynn of Port Huron, who is in charge of marine sales for the National Lead Co. of New York: "We used Phoenix metal in 1902 in two of our steamers and it gave perfect satisfaction. In the past season we put it in the crank pin journals of two of our largest ships, the Mauch Chunk and Wilkes Barre. The engineers report that the wear on the journals fitted with Phoenix metal is much less than that on the brass formerly used, and they state that they are perfectly satisfied with it."

The senate has just passed a bill authorizing a monument to be erected to the memory of John Paul Jones.

BELLEVILLE WATER-TUBE BOILERS

NOW IN USE (SEPTEMBER, 1903)

On Board Sea-going Vessels, NOT INCLUDING New Installations Building or Erecting.

French Navy	355,560 H. P.
English Royal Navy	929,300 "
Russian Imperial Navy	227,500 "
Japanese Imperial Navy	122,700 "
Austrian Imperial Navy	56,700 "
Italian Royal Navy	13,500 "
Chilian Navy	26,500 "
Argentine Navy	13,000 "
The "Messageries Maritimes" Company	87,600 "
Chemins de fer de l'Ouest: (The French Western Railway Co.) Steamships plying between Dieppe and Newhaven	18,500 "
Total Horse Power of Boilers in Use	1,850,860

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Works and Dock Yards of the Ermitage at Saint-Denis (Seine), France. Telegraphic Address: Belleville, Saint-Denis Sur-Seine

MOTOR BOATS AND OTHER PLEASURE CRAFT.

New York, Jan. 27.—It was at the time of the international yacht races off Sandy Hook last summer that the motor-boat Standard made her first appearance. Though boats with gasoline motors were even then quite numerous, the advent of the Standard caused exceptional comment in yachting circles. Her phenomenal speed was exhibited before the admiring crowds that returned from the international cup races, and the papers furnished detailed accounts of her engines, one of the reporters telling us they were "built like a watch." In these exhaustive descriptions the engines were compared with the motors of automobiles, and the public, perceiving a great deal of similarity between the two, unhesitatingly dubbed the Standard an "automobile boat." It is true that many builders are inclined to use unmodified automobile engines. A motor when placed in an automobile is only called upon to exert its full power on exceptional occasions, while if stationed in a boat full and unabated demands are going to be made upon its strength and endurance. And this is one of the reasons why a boat that is equipped with an exact copy of an automobile motor can hardly be expected to give entire satisfaction. The watermobile is predicted to become the most popular craft next season, but its motor, though in some respects similar to the one in use on the automobile, will be designed on different lines. It should also be known that these boats have as yet not by any means reached their limit as to size and speed.

In Europe also that this class of boats has found favor among the yachting fraternity. In a couple of months the prince of Monaco expects to press the button that will open the "Exposition Internationale des Canots Automobiles." The "Canots Automobiles" will be on view on that large tract of land—I have forgotten its Italian name—where Mr. Santos-Dumont erected a shed two years ago for his airship. A couple of inclined planes furnished with electrically-operated trucks will convey any of the boats to the beach of the Bay of Monaco. An entrance fee of 100 francs will be charged for each boat. This fee entitles the boat to a participation in all the races; and if it be understood that the exhibition grounds afford only room for 100 boats while 200,000 francs have been offered in prizes, all owners of speedy motor boats in that neighborhood will make early preparations to gain admisssion for their property. The American Power Boat Association intends to offer a perpetual challenge cup to any of the recognized yacht clubs. Any power boat that measures not less than 25 ft. on the water line, and, if hailing from America, entitled to fly the colors of some club belonging to the association, will be given an opportunity to win a $1,000 trophy. The so-called point system will be in force for the picking of the winner. For the benefit of those of your readers who never heard of this system it might be briefly explained as follows: Each contesting boat is considered to have gained one point for going over the course and an additional point for each boat she succeeds in defeating; and all boats are to start in one class and at the same time, irrespective of shape, size or manner of propulsion. Even those among us who could under no consideration become interested in the outcome of such a race may gather at the starting point and take advantage of this unique opportunity to compare power boats of various designs. While there seems to be at present an especially brisk demand for the smaller types of power boats, designers and builders claim not to observe any falling off in orders for sail yachts. True it is, however, that many believers in the "windjammer" have decided to install small auxiliary engines. They are ever anxious to have it understood, however, that the power is only used when the wind proves insufficient.

The yawl-rigged yacht is deservedly becoming more popular each season. An experienced yachtsman on Long island once summed up sixteen reasons why the yawl rig is preferable to any other on small craft. One reason I remember was on account of the heaviest sail being inboard, thus precluding the necessity of some one swinging over the stern across a boom when reefing a mainsail. And the mention of reefing reminds me of another of the Long islander's quaintly-expressed reasons. Said he: "Suppose you are out in a yawl and it commences to blow so hard that you must reef—you have not to reef at all, but just to lower the mainsail and the yawl is not only under easy canvas but perfectly balanced with jib and jigger.

A beautiful yawl of the following dimensions is building at City island: Length over all, 50 ft.; beam, 12 ft.; draught, 7 ft. This vessel's sails have been ordered from Ratsey & Lapthorn, the City island branch of the English firm that made the Shamrock's sails. And, of course, according to the English style, this yawl's sails will have to do their work without "footstops"—an American innovation regarded as necessary when speed is the aim. In the case of this yacht the orders called for a beautiful yawl for cruising, not racing, and loose-footed sails are regarded by many as an adjunct to the beauty of a boat. F. H.

The house committee on marine and fisheries has made a favorable report upon the Gardner bill providing for a commission to investigate the whole question of ship subsidy. The bill was first amended so as to make the commission consist of five members each of the house and senate. To the commission the widest latitude is given in its investigations. Its report is to be made on the first day of the next session of congress.

Dredge for Sale.

Capacity 1¼ yds., 30 ft. steel boom crane; 8x10 duplex hoisting engines; 6x6 duplex swinging engines; upright boiler, 50 in by 7 ft.; hull 18x65, 5½ ft. sides; all in good working condition. Inquire of E J Doane, room 2, Drummond block, Toledo, O. Jan 28

Scow for Sale.

Size 20x64 ft ; 5 ft depth; 2 ft. bulwark. Will carry deck load 90 tons. Built of white pine, white oak and cypress. Built in fall of 1902. Cost $1,100 co. Best small scow on the lakes Inquire of E J. Doane, room 2 Drummond block, Toledo, O. Jan. 28

Steamships, Government, Revenue and Lighthouse Vessels, Yachts and Boats of all descriptions

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Covering everything that can possibly be required in

Furniture, Beds, Carpets and Rugs, Upholsteries, Bedding, Groceries,

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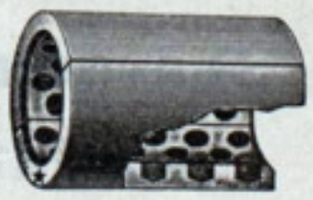
NEW YORK CITY.

Please mention Marine Review, when writing.



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Wrought Iron Hook and Strap, Galvanized Iron Shells and Sheaves. Sheaves fitted with Genuine Star Metaline Bushings with Metaline Side Bearings.

These Blocks Save the Rope and Outwear all others.

Send for 1902 Catalogue M. A. R. FREE.

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Seaboard Steel Casting Co.,
Chester, Pa.

MARINE EXHIBIT AT SPORTSMEN'S SHOW.

From present indications, the tenth annual sportsmen's show at Madison Square Garden, Feb. 19 to March 5, promises to be the most successful of any yet held. As a spectacle it will be impressive, the entire arrangement and the scenic effects combining strongly to this end. Action will be lent to the scenic effects at the eastern end of the amphitheater by the revolving wheel of an old water mill, and the mountain streams which will tumble in cascades through artificial gorges to empty into the artificial lake, which this year will be larger and more attractively constructed than at any previous sportsmen's show. The lake will be 190 ft. in length by 70 ft. in width, and will be designed and provided principally for the demonstration of high-power automobile launches, varying in length from 25 ft. to 35 ft. In fact, the marine exhibit of the show this year will be one of its strongest features, the power boat industry being represented to a greater extent than it has ever been at a similar exhibit in this country. So great has been the demand for space by exhibitors of this class that it has been necessary to locate the space originally designed for the fly casting tournament elsewhere. Originally the space set aside was on the southern or Twenty-Sixth street side of the garden, immediately facing the lake, and on the cross-section at the Fourth avenue end, while the entire stretch of 190 ft. on the Twenty-Seventh street side was assigned to the sport of fly casting. So great has been the demand for space, however, that the entire lake frontage has now been given up to marine exhibits, and the fly casters will be provided with a tank of ample width and length suspended over the northern promenade of the amphitheater and on a level with the balcony promenade. That this feature of the show should have developed to such proportions was unanticipated by the management but it is most satisfactory evidence of the value of the Madison Square exhibit to the builders of marine engines and power launches. Thus far, space has been assigned to the following representative concerns in this line: Western Gas Engine Co., Mishawaka, Ind.; Mr. J. W. Newbury, New York; Pierce Engine Co., Racine, Wis.; C. H. Blomstrom Motor Co., Detroit; Lozier Motor Co., Plattsburg, N. Y.; Messrs. Penhard & Levassor; Messrs. Smith & Mabley; Messrs. Hollander & Tangeman; Gas Engine & Power Co. and Charles L. Seabury & Co.; the Wm. H. Brodie Co.; the Fairbanks Co.; Electric Launch Co., Bayonne City, N. J.; Eagle Bicycle Mfg. Co., Torrington, Conn.; United States Long Distance Auto Co., Jersey City, N. J.; Lackawanna Motor Co., Detroit; Chas. A. Strelinger Co., Detroit; Buffalo Gasoline Motor Co., Buffalo; and Messrs. Reeves & White, Port Richmond, N. Y.

Congressman Roberts has introduced a bill in the house of representatives that all officers of the navy with creditable records who served during the civil war and who were placed on the retired list prior to March 3, 1899, shall be advanced on the retired list to the rank of the next higher grade.

Vessels for Sale.

Steam barge, two years old; Neafie & Levy machinery; carries 300 tons.
2,000-ton barge.
Side-wheel steamer, iron hull.
Small iron ship.
Three steam yachts for pleasure or towing.
Address 218 Walnut St., Philadelphia.
Feb. 4

Steamer for Sale.

For sale on reasonable terms, the steamer A. A. Turner. Vessel is in good condition and can be seen at Cleveland. Apply to A. C. McLean, Saginaw, Mich., or Capt. H. May, care Fisher-Wilson Co., Cleveland.
Feb. 18

Lake Tug for Sale or Charter.

Tug Kate Williams. Length 113 ft., beam 21 ft., S. C. engine 22 and 40 x 30 in. Fire box boiler 8 x 17 ft. Rates A 1½. Entirely rebuilt in 1901. Good condition. Lake Shore Stone Co., 97 Wisconsin St., Milwaukee, Wis.
Feb. 11

U.S. ENGINEER'S OFFICE, Jones Bldg., Detroit, Mich., Jan. 15, 1904. — Sealed proposals for rock and earth excavation under continuing contracts, for improving Middle and West Neebish Channels, St. Marys River, Mich., at West Neebish Rapids will be received here until 2 p. m. (standard time), March 8, 1904, and then publicly opened. Information furnished on application. W. H. BIXBY, Major, Eng'rs.
Mar. 3

U.S. ENGINEER'S OFFICE, Jones Bldg., Detroit, Mich., Jan. 16, 1904. — Sealed proposals for dredging under continuing contracts for improving Middle and West Neebish Channels, St Marys River, Mich., at Hay Lake and Mud Lake, will be received here until 2 p. m. (standard time), March 9, 1904, and then publicly opened. Information furnished on application. W. H. BIXBY, Major, Eng'rs.
Mar. 3

U. S. ENGINEER OFFICE, Jones building, Detroit, Mich., January 5, 1904. Sealed proposals for removing boulders, excavating limestone bed rock, and dredging in lower Detroit River, will be received here until 2 p. m. (Standard time) February 25, 1904, and then publicly opened. Information furnished on application. W. H. BIXBY, Major, Eng'rs. Feb. 18

U.S. ENGINEER OFFICE, Duluth, Minn., Jan. 2, 1904 — Sealed proposals for furnishing 4,300 barrels Portland cement for concrete superstructure to breakwater at Marquette, Mich., will be received here until noon, Feb 2, 1904, and then publicly opened. Information on application. CHAS. L. POTTER, Capt., Engrs.
Jan 28

WHITE OAK
TIMBERS, PLANK
AND
DIMENSION STOCK
F. S. SHURICK,
18 Broadway, NEW YORK CITY

Steam Barge for Sale.

For Sale —Steam barge, 131 ft. keel, 25 ft. beam, 9 ft. deep Capacity, lumber, 260 M ft; coal, 375 tons. Good power; can hand e two or three barges Everything pertaining to this boat is in good condition. Terms cash. Address Lock Box 35, St Clair, Mich
Feb. 11

Passenger Steamer for Sale.

Up-to-date passenger and freight steamer. Capacity 400 to 500 passengers and 35 tons package freight. Speed about 15 miles an hour New fore-and-aft compound engine. Marine fire-box boiler. Everything high grade and in very best condition. Address, Indiana Transportation Co., Michigan City, Ind.
Jan. 28

Wanted.

Marine engineer to sell water tube boilers. Must be experienced in selling machinery. Address Box 54, Marine Review Pub. Co., 39-41 Wade Bldg., Cleveland, O.
tf

Steamer for Sale at Cost— $13,500.

The old Anchor Line twin-screw steamer Gordon Campbell. Two decks, gangways, hoisting machinery, etc. Suited to carrying coal, lumber, ties, package freight, etc. Spent $3,500 in repairs this year Other business requires my undivided attention and I will sell for cost to me. W. F. Carroll, 1011 Ashland block, Chicago.
t f.

Yacht for Sale.

New beautiful 100-ft. steam yacht, fully equipped. Owner physically unable to use yacht. Will sell for any reasonable offer. Yacht can be seen in Detroit. Address M. J STEFFENS, 57 East Twenty-second st., Chicago.
tf

Good Tow at a Bargain.

Ten thousand dollars will buy a lake steamer and tow barge that carry 2,700 tons of ore. Steamer has steeple compound engines and Scotch boiler. Address Box 55, Marine Review Pub Co., Wade Building, Cleveland.
Jan. 28

For Sale.

Tug Duncan City. Address, Geo. Pankrantz Lumber Co., Sturgeon Bay, Wis.
tf

Lumber Carrier Wanted.

A steamer capable of carrying 1,500 000 ft. dry lumber with not more than 16 ft. loaded draught. Address Box 57, Marine Review Pub. Co., Wade Building, Cleveland, O.
Feb. 11

Marine Engines for Sale.

Gasoline engines complete, 3 to 50 h. p. Reversing gear, solid three-blade propellers. For particulars address Sarvent Marine Engine Works, 26-28 West Randolph St., Chicago.
Feb. 11

Tugs for Sale.

Tug Engine 12x12, Boiler allowed 100 lbs st'm
Tug Engine 17x17, Boiler allowed 90 lbs st'm
Tug Engine 18x18, Boiler allowed 125 lbs st'm
Tug Engine 18x20, Boiler allowed 100 lbs st'm
Tug Engine 18x20, Boiler allowed 115 lbs st'm
For further information apply to L. S. Sullivan, Toledo, O.
Feb. 25.

Marine Exhibits
at the
Sportsmen's Show
Madison Square Garden, New York,
February 19 to March 5,

Will be one of the principal features of the Tenth Annual Exhibit.

A large 190x60 feet will afford every facility for demonstrations with gasolene and electric launches.

The following leading marine engine and launch builders have already secured exhibit space:

Western Gas Engine Co.
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Lozier Motor Co
Electric Launch Co.
Panhard & Levassor
Eagle Bicycle Mfg. Co.
Smith & Mabley
Hollander & Tangeman
Standard Motor Construction Co.
Gas Engine & Power Co., and Charles L. Seabury & Co.
Lackawanna Motor Co.
The Charles A. Strelinger Co.
Buffalo Gasolene Motor Co.
White Cratt & Power Co.
Wm. H. Brodie Co.
The Fairbanks Co.

A limited amount of space still unsold.
For further particulars, address
SPORTMEN'S EXHIBITION CO.,
1123 Broadway, New York City. Feb. 11

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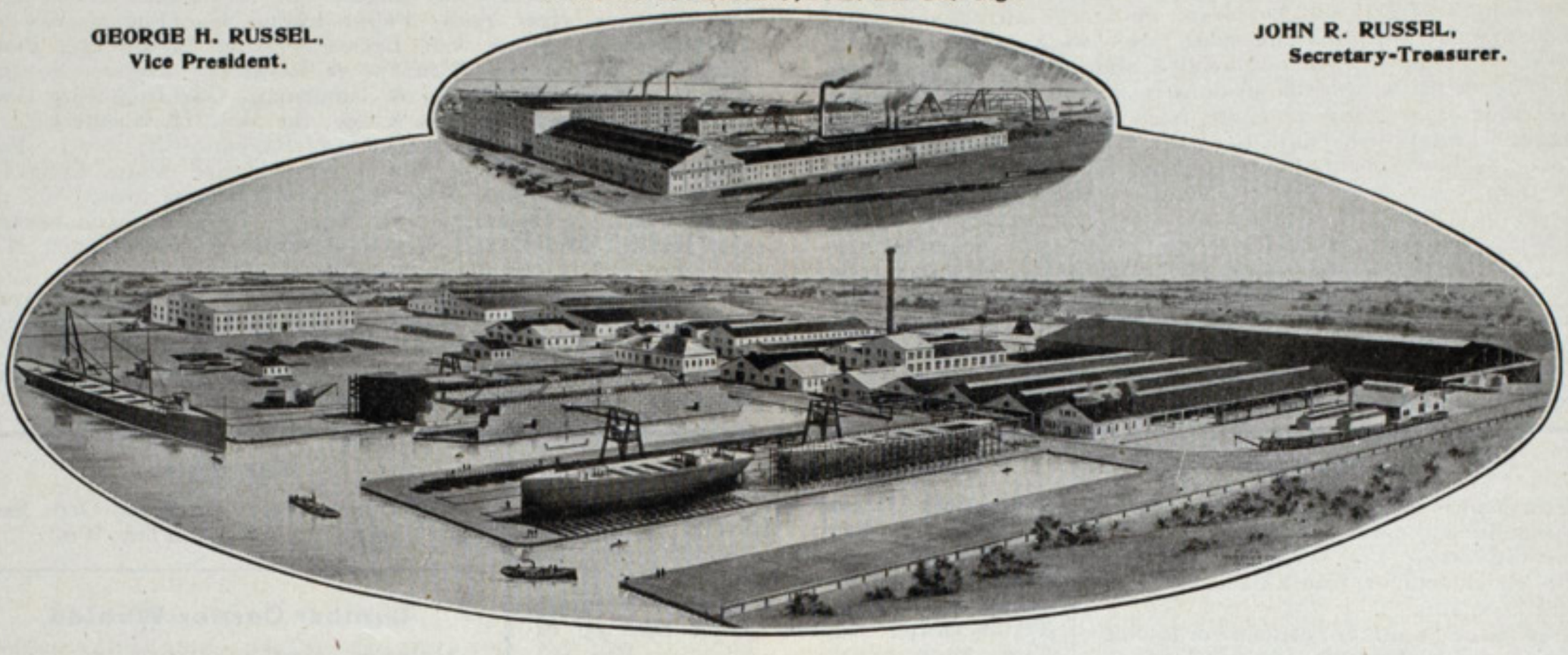

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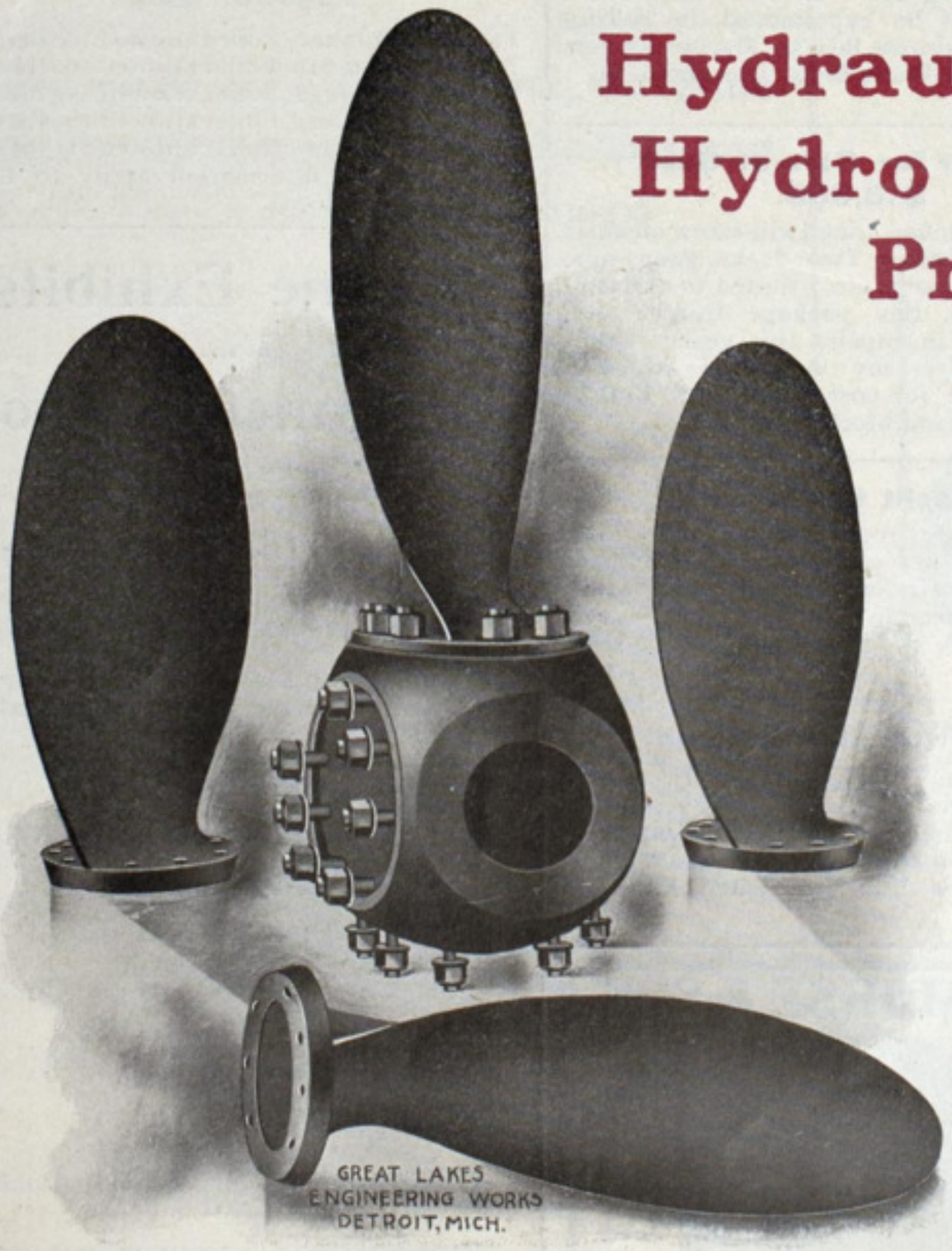

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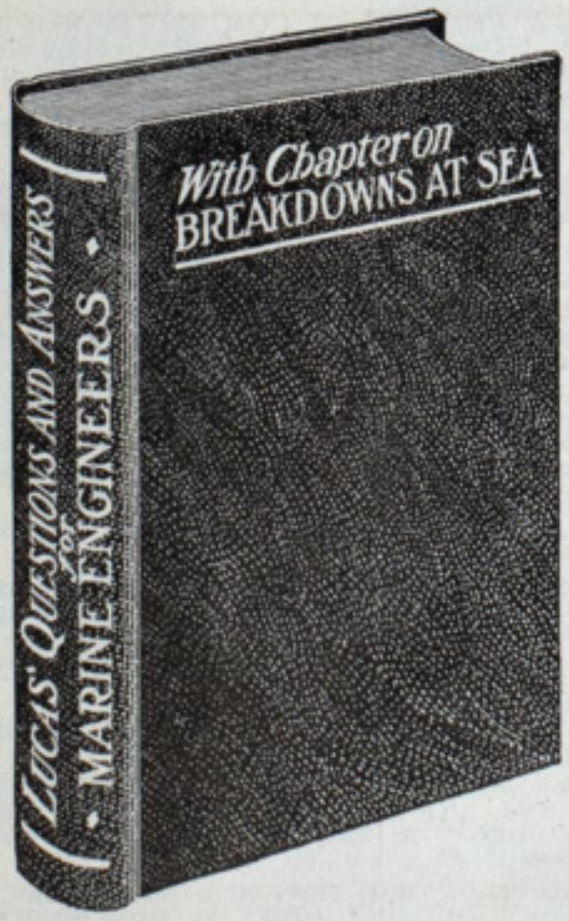

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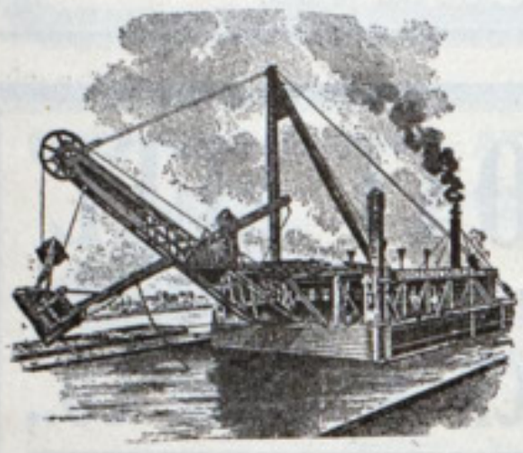

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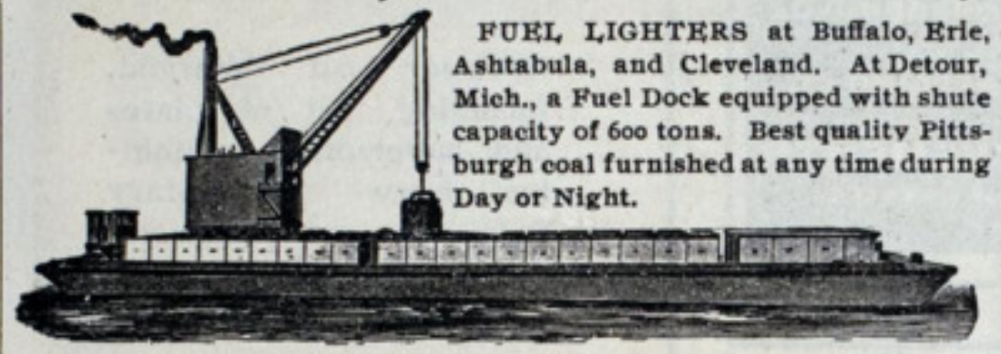

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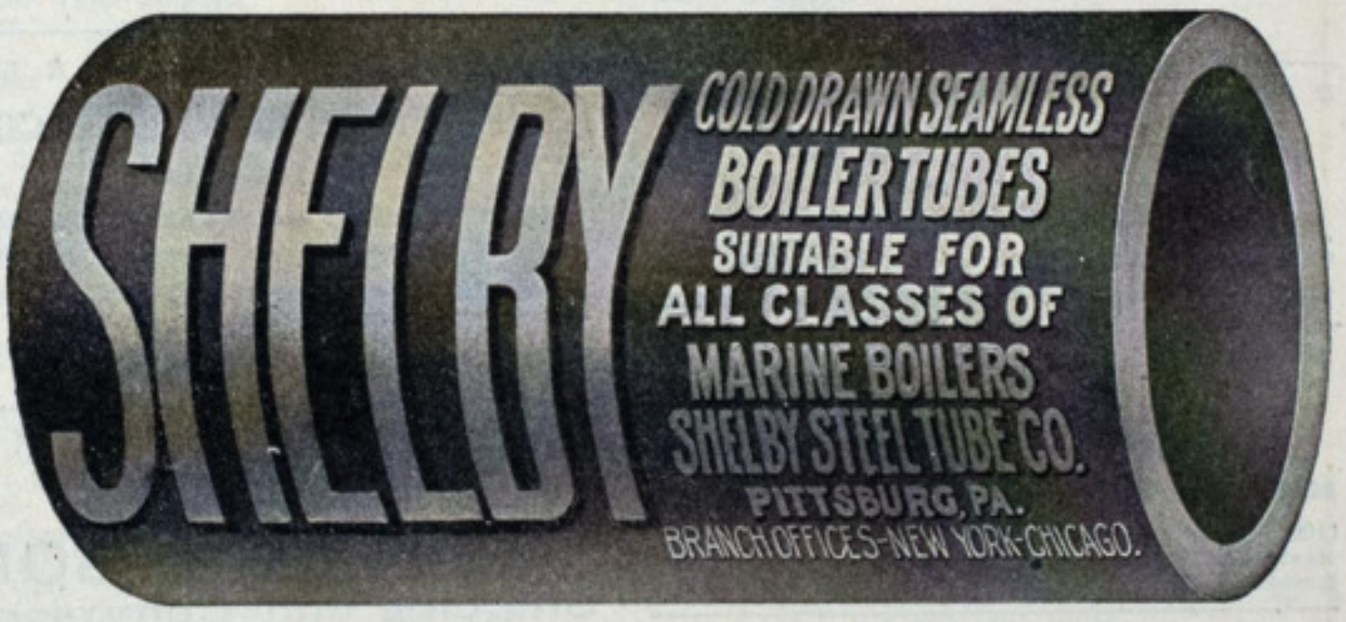

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Learmonth, Robert.....Buffalo.
Reilly Repair & Supply Co., James....New York.
Ross Valve Co.....Troy, N. Y.

FIXTURES FOR LAMPS, OIL OR ELECTRIC.

General Electric Co.....Schenectady, N. Y
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

FORGES.

Sturtevant, B. F. Co.....Boston.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.

Cleveland City Forge & Iron Co.....Cleveland.
Fore River Ship & Engine Co.....Quincy, Mass.
Macbeth Iron Co.....Cleveland.

FLUE WELDING.

Fix's, S. Sons.....Cleveland.

FURNACES FOR BOILERS.

Continental Iron Works.....New York.

FUELING COMPANIES AND COAL DEALERS.

Hanna, M. A. & Co.....Cleveland.
Ironville Dock & Coal Co.....Toledo, O.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburg Coal & Iron Co.....Buffalo.
Smith, Stanley B., & Co.....Detroit.
Smith Coal & Dock Co., Stanley B.....Toledo, O.
Youghiogheny & Lehigh Valley Coal Co....Chicago.

GALLEY UTENSILS.

Meckes, John.....Cleveland
Siegel Cooper Co.....New York.

GASKETS, RUBBER.

New York Belting & Packing Co.....New York.

GAS BUOYS.

Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.

Chase Machine Co.....Cleveland.

GAUGES, STEAM AND VACUUM.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Bonner & Co., Wm T.....Boston
Lunkenheimer Co.....Cincinnati.

GRAPHITE.

Dixon Crucible Co., Joseph.....Jersey City, N. J.

GROCERIES AND SUPPLIES.

Siegel Cooper Co.....New York.

HATCH FASTENERS.

Mulholland, Capt. M.....Cleveland.

HAMMERS, STEAM.

Chase Machine Co.....Cleveland.

HEATING APPARATUS.

Sturtevant, B. F. Co.....Boston.

HOISTS FOR CARGO, ETC.

American Ship Building Co.....Cleveland.
Brown Hoisting Machinery Co. (Inc.)....Cleveland.
Chase Machine Co.....Cleveland.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....New York.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mfg. Co.....New York.
Marine Iron Co.....Bay City.
Pawling & Harnischfeger.....Milwaukee.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

HOLLOW STAYBOLT IRON.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

HOSE, RUBBER.

New York Belting & Packing Co.....New York.

HYDRAULIC DREDGES.

Great Lakes Engineering Works.....Detroit.

HYDRAULIC TOOLS.

Watson-Stillman Co., The.....New York.

ICE MACHINERY.

Roelker, H. B.....New York.

INDICATORS FOR STEAM ENGINES.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.

INJECTORS.

American Injector Co.....Detroit.
Crane Co.....Chicago.
Jenkins Bros.....New York.
Lunkenheimer Co.....Cincinnati.
Penberthy Injector Co.....Detroit, Mich.

INSURANCE, MARINE.

Brown & Co.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Fleming & Co., P. H.....Chicago.
Frankfort Marine, A. & P. G. Ins. Co....New York.
Gilchrist & Co., C. P.....Cleveland.
Hawgood & Co., W. A.....Cleveland.
Helm & Co., D. T.....Duluth.
Hutchinson & Co.....Cleveland.
McCarthy, T. R.....Montreal.
McCurdy, Geo. L.....Chicago.
Mitchell & Co.....Cleveland.
Moffat & Son.....San Francisco.
Peck, Chas. E. & W. F.....New York and Chicago.
Prindiville & Co.....Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.
Voss, F. D.....New York.
Weeks, F. H.....New York.

IRON ORE AND PIG IRON.

Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.

Marine Construction & D. D. Co.....Mariner's Harbor, S. I., N. Y.
Truscott Boat Mfg. Co.....St. Joseph, Mich.
Willard, Chas. P.....Chicago.

LIFE FLOATS.

Carley Life Float Co.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS.

Armstrong Cork Co.....Pittsburg.
Carley Life Float Co.....New York.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Long Island City, N. Y.
Marine Construction & Dry Dock Co.....Mariner's Harbor, S. I., N. Y.

LIGHTS, SIDE AND SIGNAL.

Russell & Watson.....Buffalo.

LOGS.

Bliss, John & Co.....New York.
Nicholson Ship Log Co.....Cleveland.
Walker & Sons, Thomas.....Birmingham, Eng.
Also Ship Chandlers.

LUBRICATING GRAPHITE.

Dixon Crucible Co., Joseph.....Jersey City, N. J.

LUBRICATORS.

Crane Co.....Chicago.
Lunkenheimer Co.....Cincinnati.

LUMBER.

Martin-Barriss Co.....Cleveland.
Shurick, F. S.....New York.

MACHINISTS.

Chase Machine Co.....Cleveland.
Lockwood Mfg. Co.....East Boston, Mass.
Macbeth Iron Co.....Cleveland.
Mooers & Co., H.....Milwaukee.
Union Machine & Boiler Co.....Cleveland.

MACHINE TOOLS (WOOD WORKING).

Atlantic Works, Inc.....Philadelphia.

MARINE RAILWAYS, BUILDERS OF.

Crandall & Son, H. I.....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W.....New York.
Meckes, John.....Cleveland
Siegel Cooper Co.....New York.

MECHANICAL DRAFT FOR BOILERS.

American Ship Building Co.....Cleveland.
Bloomsburg & Co., H.....Baltimore, Md.
Detroit Ship Building Co.....Detroit.
Sturtevant, B. F. Co.....Boston.

METALLIC PACKING.

Katzenstein, L. & Co.....New York.
U. S. Metallic Packing Co.....Philadelphia.

METAL POLISH.

Bertram's Oil Polish Co.....Boston.

MOTORS, GENERATORS—ELECTRIC.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Sturtevant, B. F. Co.....Boston.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

NAUTICAL INSTRUMENTS.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

NAUTICAL SCHOOLS.

Chicago Nautical School.....Chicago.
McNevin's Navigation School.....Detroit.
McNevin's Navigation School.....San Francisco.
Seattle Nautical School.....Seattle, Wash.

NAVAL ARCHITECTS.

Hynd, Alexander.....Cleveland.
Kidd, Joseph.....Duluth, Minn.
Lovejoy, H. O.....Buffalo.
Matteson & Drake.....Philadelphia.
Mosher, Chas. D.....New York.
Nacey, James.....Cleveland.
Newman & Merryweather.....New York.
Rice, Henry.....Buffalo.
Sadler, Perkins & Field.....New York.
Steel, Adam.....Cleveland.
Wood, W. J.....Chicago.

OAKUM.

DeGrauw, Aymar & Co.....New York.
Stratford Oakum Co.....Jersey City, N. J.

OIL FOR PAINTING.

Sipe & Co., James B.....Allegheny, Pa.

OILS AND LUBRICANTS.

Dixon Crucible Co., Joseph.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.

American Steam Packing Co.....Boston.
Crane Co.....Chicago.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
New York Belting & Packing Co.....New York.
United States Metallic Packing Co....Philadelphia.

PAINTS.

Baker, Howard H. & Co.....Buffalo.
Detroit Varnish Co.....Detroit.
Detroit White Lead Works.....Detroit.
New Jersey Zinc Co.....New York.
Sipe & Co., James B.....Allegheny, Pa.
Upson-Walton Co.....Cleveland.

PATENT ATTORNEYS.

Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.

Atlantic Works, Inc.....Philadelphia.

PILE DRIVING AND SUBMARINE WORK.

Buffalo Dredging Co.....Buffalo.
Chicago & Gt. Lakes Dredge & Dock Co....Chicago.
Dunbar & Sullivan Dredging Co.....Buffalo.
Fitz-Simon & Connell Co.....Chicago.
Smith Co., L. P. & J. A.....Cleveland.
Starke Dredge & Dock Co., C. H.....Milwaukee.

PIPE, WROUGHT IRON.

Bourne-Fuller Co.....Cleveland.
Crane Co.....Chicago.
Macbeth Iron Co.....Cleveland.

PLANING MILL MACHINERY.

Atlantic Works, Inc.....Philadelphia.

PLATES—SHIP, STRUCTURAL, ETC.

Bourne-Fuller Co.....Cleveland.

PLUMBING, MARINE.

Reilly Repair & Supply Co., James....New York.
Sands, Alfred B. & Son.....New York.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

PNEUMATIC TOOLS.
Allen, John F.....New York.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston.

PRESSURE REGULATORS.
Kieley & Mueller .....New York.
Ross Valve Co.....Troy, N. Y.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works .....East Boston, Mass.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Ship Building Co.....Detroit.
Fore River Ship & Engine Co.....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mfg. Co.....East Boston, Mass.
Macbeth Iron Co.....Cleveland.
Maryland Steel Co.....Sparrow's Point, Md.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co.Newport News, Va.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.
Risdon Iron Works .....San Francisco.
Roelker, H. B.....New York.
Sheriffs Mfg. Co.....Milwaukee.
Superior Shipbuilding Co.....Superior, Wis.
Thropp & Sons Co., J. E.....Trenton, N. J.
Trout, H. G.....Buffalo.
United States Ship Building Co.....New York.

PROJECTORS, ELECTRIC.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F., Mfg. Co.....New York.
Great Lakes Engineering Works.....Detroit.
Kingsford Foundry & Machine Wks..Oswego, N. Y.

PUNCHES, RIVETERS, SHEARS.
Allen, John F.....New York.

RANGES.
Russell & Watson .....Buffalo.
Siegel Cooper Co.....New York.

REFRIGERATING APPARATUS.
Roelker, H. B.....New York.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register .....Cleveland.
Record of American & Foreign Shipping..New York.

RIVETING MACHINES.
Allen, John F.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crane Co. .....Chicago.
Hayden Mfg. Co., N. L.....Columbus, O.
Lunkenheimer Co. .....Cincinnati.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby .....Boston.

SALVAGE COMPANIES.
See Wrecking Companies.

SCHOOLS, NAUTICAL.
Chicago Nautical School .....Chicago.
McNevin's Navigation School .....Detroit.
McNevin's Navigation School .....San Francisco.
Seattle Nautical School .....Seattle, Wash.

SEARCH LIGHTS.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

SHEARS.
See Punches, Rivets, and Shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works .....East Boston, Mass.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Ship Building Co.....Detroit.
Fore River Ship & Engine Co.....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mfg. Co.....East Boston, Mass.
Manitowoc Dry Dock Co.....Manitowoc, Wis.
Maryland Steel Co.....Sparrow's Point, Md.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co.Newport News, Va.
Risdon Iron Works .....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Shipowner's Dry Dock Co.....Chicago.
Smith & Son, Abram .....Algonac, Mich.
United States Ship Building Co.....New York.
Willard, Chas. P. & Co.....Chicago.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Reilly Repair & Supply Co., James.....New York.
Upson-Walton Co.....Cleveland.

SHIP LANTERNS AND LAMPS.
Russell & Watson .....Buffalo.

SHIP TIMBER.
Martin-Barriss, Co. .....Cleveland.
Shurick, F. S.....New York.

SMOOTH-ON COMPOUND, FOR REPAIRS.
Smooth-On Mfg. Co.....Jersey City, N. J.

STAYBOLTS, IRON OR STEEL, HOLLOW, OR, SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSELS FOR SALE.
Elwell, Jas. W. & Co.....New York.
Gilchrist & Co., C. P.....Cleveland.
Holmes, Samuel .....New York.
McCarthy, T. R.....Montreal, Can.
Moffat & Son.....San Francisco.
Newman & Merryweather .....New York.
Weeks, F. H.....New York.

STEAMSHIP LINES, PASS. AND FREIGHT.
American Line.....New York.
International Mercantile Marine Co....Philadelphia.
Pere Marquette R. R. & S. S. Line.....Milwaukee.
Red Star Line .....New York.

STEEL CASTINGS.
Seaboard Steel Casting Co.....Chester, Pa.
Macbeth Iron Co.....Cleveland.

STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Dake Engine Co.....Grand Haven, Mich.
Detroit Ship Building Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Moulton Steering Engine Co.....New York.
Pawling & Harnischfeger .....Milwaukee.
Sheriffs Mfg. Co. .....Milwaukee.

STOCKS, BONDS, SECURITIES.
Fahey & Co.....Cleveland.

SUBMARINE DIVING APPARATUS.
Morse & Son, A. J.....Boston.
Schrader's Son, A.....New York.

SURVEYORS, MARINE.
Gaskin, Edward .....Buffalo.
Hynd, Alexander .....Cleveland.
Lovejoy, H. O. .....Buffalo.
Matteson & Drake .....Philadelphia.
Nacey, James .....Cleveland.
Newman & Merryweather .....New York.
Rice, Henry .....Buffalo.
Steel, Adam .....Cleveland.
Wood, W. J.....Chicago.

TESTS OF MATERIALS.
Hunt, Robert W. & Co.....Chicago.
Pittsburg Testing Laboratory Ltd.....Pittsburg.

TILING, INTERLOCKING RUBBER.
New York Belting & Packing Co.....New York.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
Allen, John F. .....New York.
Watson-Stillman Co. .....New York.

TOOLS, WOOD WORKING.
Atlantic Works, Inc.....Philadelphia.

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.
Donnelly Salvage & Wrecking Co....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.Midland, Ont.

TRAPS, STEAM.
Kieley & Mueller .....New York.
Lunkenheimer Co. .....Cincinnati.
Sturtevant Co., B. F., Jamaica Plain.....Boston.

TRUCKS.
Boston & Lockport Block Co.....Boston.

TUBING, SEAMLESS.
Shelby Steel Tube Co.....Pittsburg, Pa.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co.....Boston.
Ashton Valve Co .....Boston.
Crane Co. .....Chicago.
Jenkins Bros. .....New York.
Kieley & Mueller .....New York.
Lunkenheimer Co. .....Cincinnati.
Mooers & Co., H.....Milwaukee.
Ross Valve Co. .....Troy, N. Y.

VALVES FOR WATER AND GAS.
Ross Valve Co.....Troy, N. Y.

VARNISHES.
Detroit Varnish Co .....Detroit.
Detroit White Lead Works.....Detroit.
New Jersey Zinc Co.....New York.
Also Ship Chandlers.

VENTILATING APPARATUS FOR SHIPS.
Sturtevant, B. F. Co.....Boston.

VESSEL AND FREIGHT AGENTS.
Boland, John J.....Buffalo.
Brown & Co. .....Buffalo.
Elwell, Jas. W. & Co.....New York.
Elphicke, C. W. & Co.....Chicago.
Fleming & Co., P. H.....Chicago.
Gilchrist & Co., C. P.....Cleveland.
Hall & Root .....Buffalo.
Helm & Co., D. T.....Duluth.
Hawgood & Co., W. A.....Cleveland.
Holmes, Samuel .....New York.
Hutchinson & Co. .....Cleveland.
McCarthy, T. R.....Montreal.
Moffat & Son .....San Francisco.
Newman & Merryweather .....New York.
Mitchell & Co. .....Cleveland.
Prindiville & Co. .....Chicago.
Richardson, W. C. .....Cleveland.
Sullivan, D. & Co.....Chicago.
Weeks F. H.....New York.

VESSEL FURNISHINGS.
Meckes John.... .....Cleveland
Siegel Cooper Co.....New York.

WIRE ROPE AND WIRE ROPE FITTINGS.
Baker, H. H. & Co.....Buffalo.
DeGrauw, Aymar & Co.....New York.
Upson-Walton Co. .....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Lunkenheimer Co. .....Cincinnati.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.
Atlantic Works, Inc.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Donnelly Salvage & Wrecking Co..Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.Midland, Ont.

YACHT AND BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Long Island City, N. Y.
Marine Construction & Dry Dock Co....New York.
Truscott Boat Mfg. Co.....St. Joseph, Mich.
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*Willard, Chas. P. & Co..... 5
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Eastward.	Arrive from West	Depart East.
No. 18, Southwestern Lim	.....	1:50am
No. 22, Lake Shore Lim...	*2:12am	*2:20am
No. 20, Chi & Cleve Ex....	*7:20am	.....
No. 28, N Y & Bost Ex....	*7:40am	*8:00am
No. 40, Toledo & Buff Ac.	†10:10am	†10:40am
No. 32, Fast Mail	*11:25am	*11:30am
No. 48, Ac via Sandusky..	11:40pm	..
No. 44, Cleve. & N. Y Sp.	.....	*3:00pm
No. 46, Southwestern Ex.	....	*3:10pm
No. 116, Conneaut Accom	.....	†4:30pm
No. 6, Lim Fast Mail....	*5:40pm	*5:45pm
No. 26, 20th Cent Lim.....	*7:40pm	*7:43pm
No. 10, C., N Y & B Sp....	*7:30pm	*7:50pm
No. 16, New Eng Ex.....	*10:30pm	*10:35pm
No. 2, Day Express.....	†9:10pm	†9.25pm
No. 126, Norwalk Accom.	†8:10am	.....

Westward.	Arrive from East.	Depart West.
No. 11, Southwestern Lim	*3:20am	.....
No. 7, Day Express.....	.....	†6:00am
No. 15, Bost & Chi Sp.....	*3:05am	*3:15am
No. 19, Lake Shore Lim..	*7:05am	*7:15am
No. 23, Western Express.	*10:30am	*10:35am
No. 29, Southwestern Sp.	‡11:10am	.....
No. 31, U S Express.....	‡11:55am	‡12:05am
No. 33, Southwestern Ex	*12:25pm	.....
No. 133, Cleve & Det Ex..	.....	*12:45pm
No. 47 Accomodation.....	†11.00am	†3:00pm
No. 141, Sandusky Accom.	.....	†3:10pm
No. 43, Fast Mail	*4:35pm	*4:40pm
No. 127, Norwalk Accom..	.....	†5:10pm
No. 37, Pacific Express...	*6:50pm	*7:20pm
No. 3, Fast Mail Lim.....	*10:50pm	*10:55pm
No. 115, Conneaut Accom.	*8:30am	.....

*Daily. †Except Sunday. ‡Except Monday.
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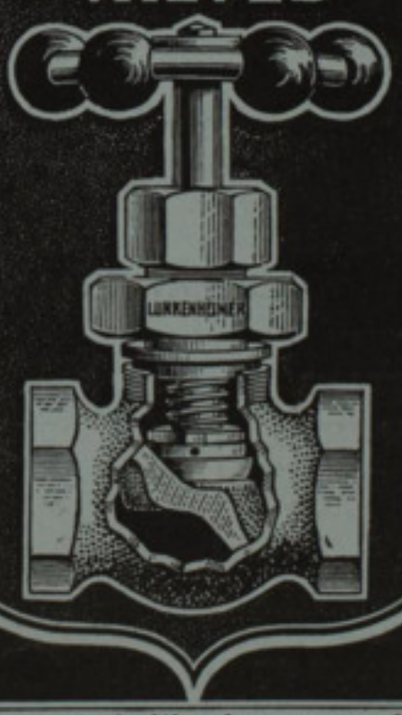

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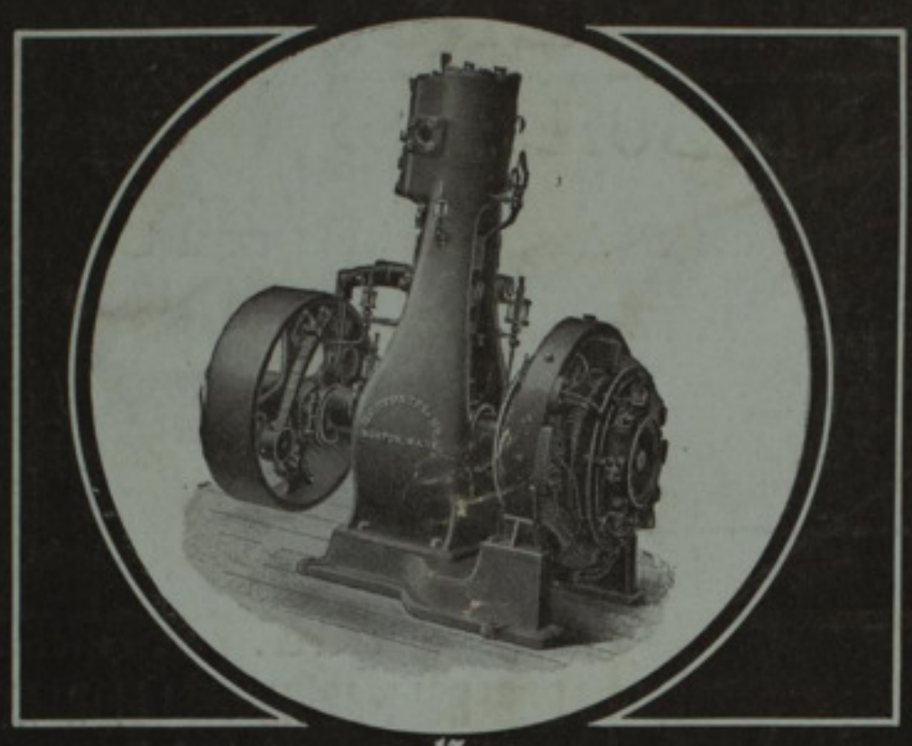

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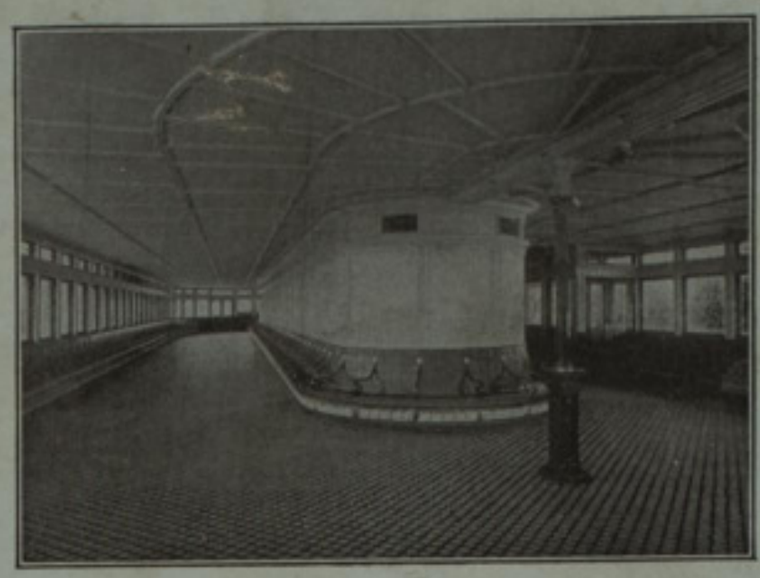

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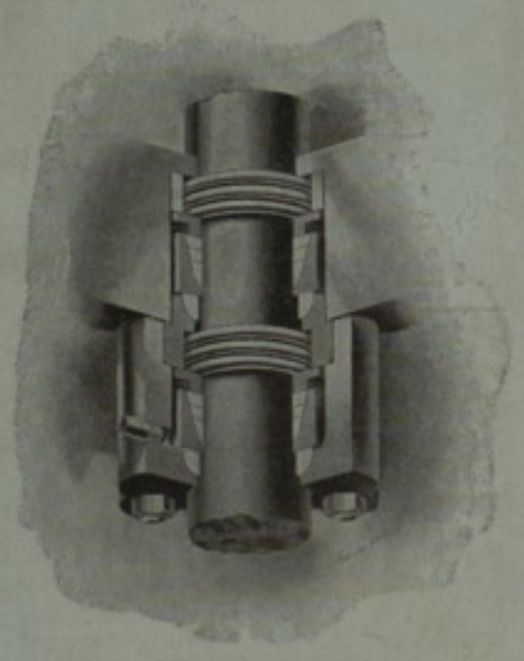

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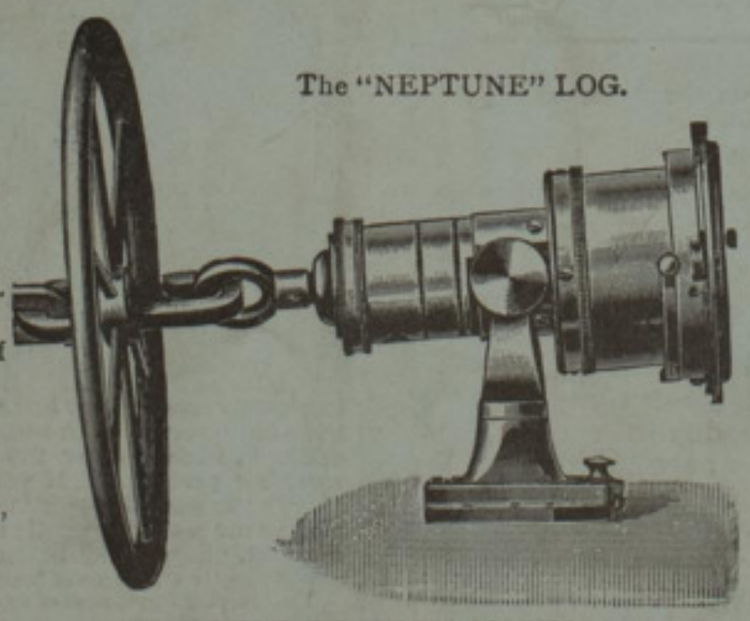

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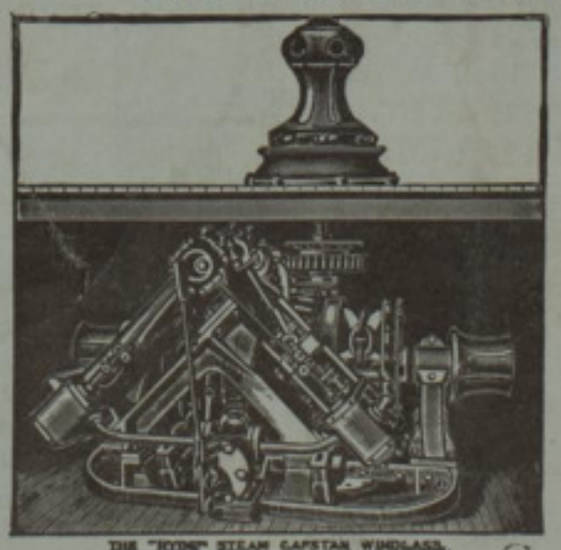

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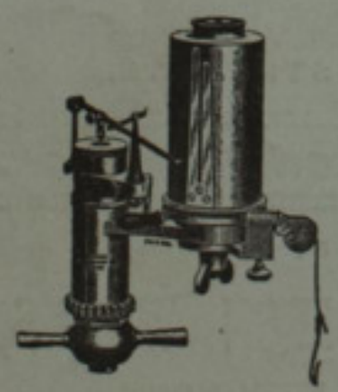

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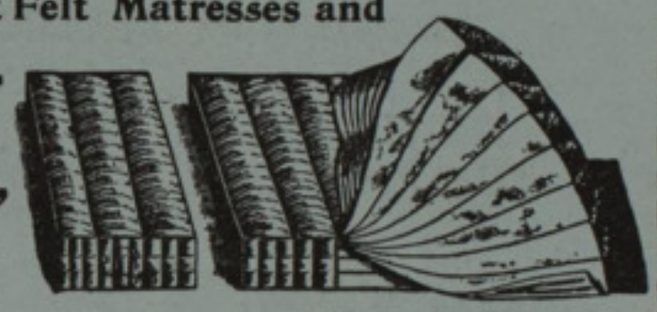

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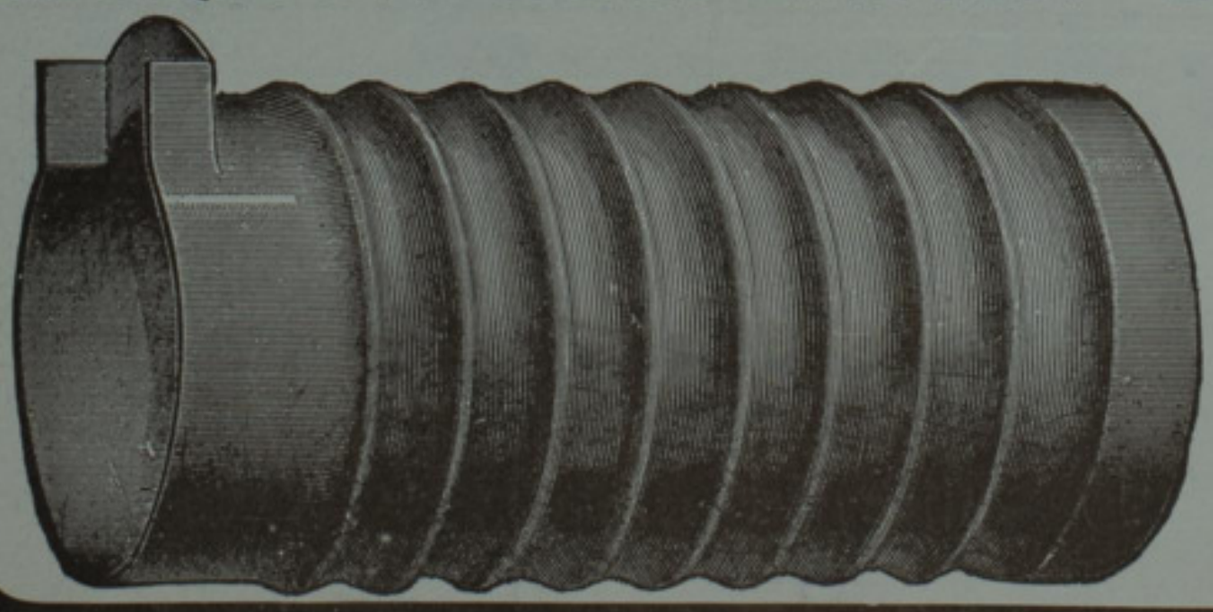

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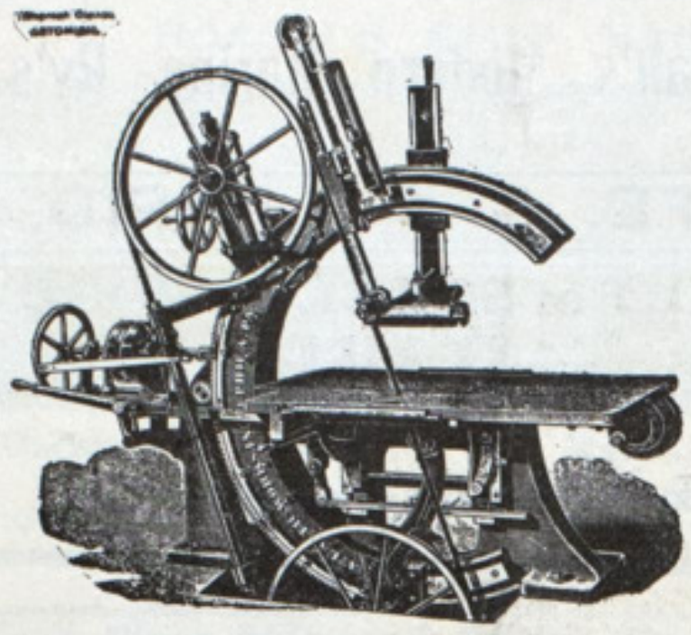

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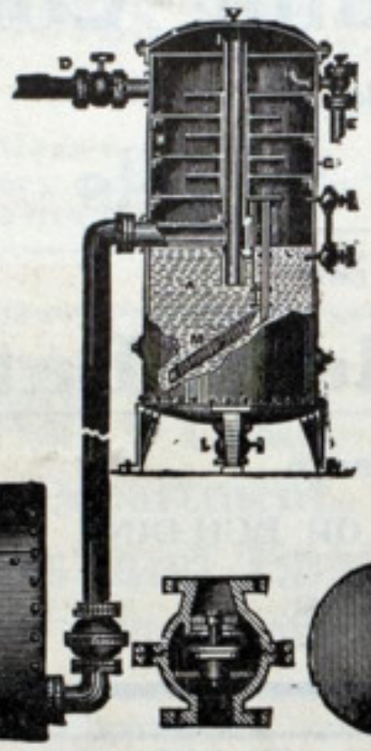

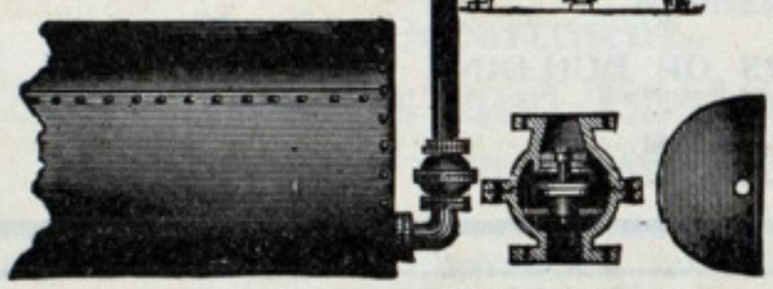

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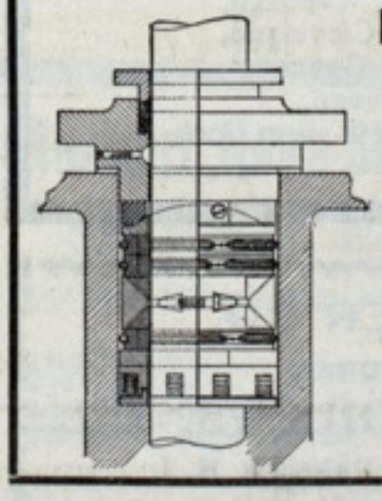

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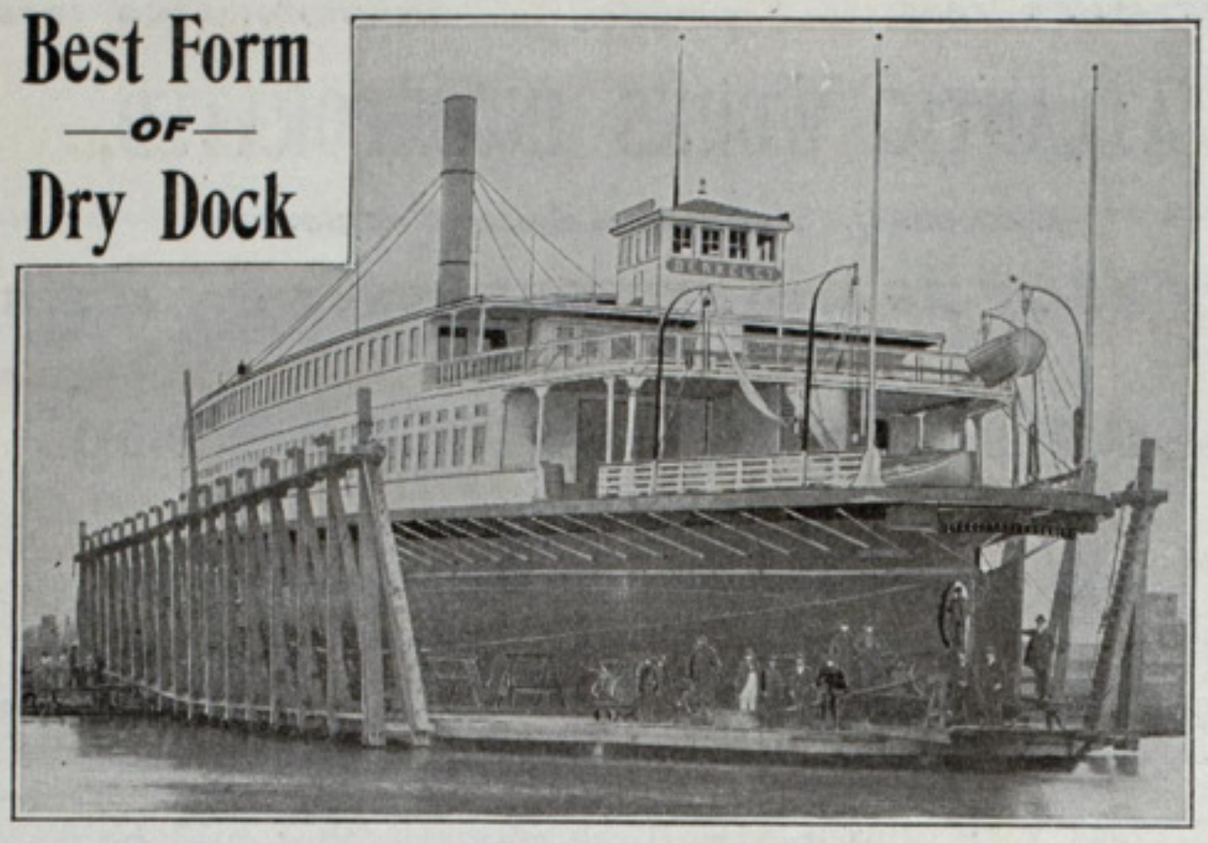

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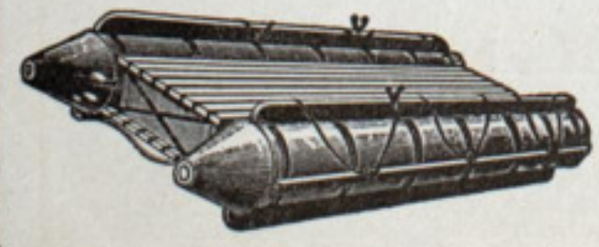

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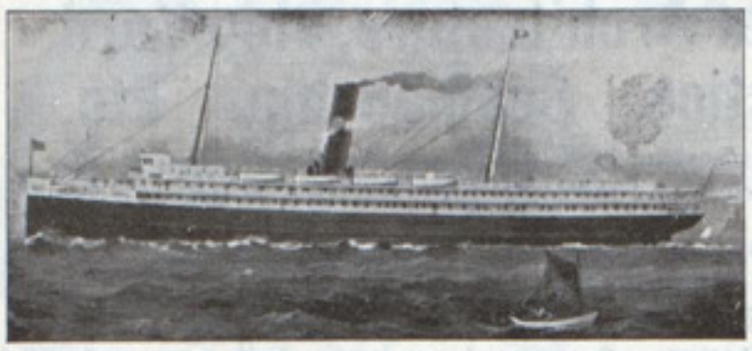

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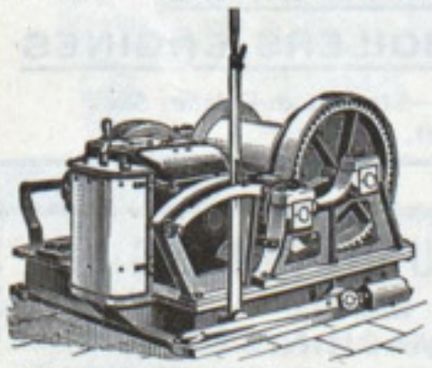

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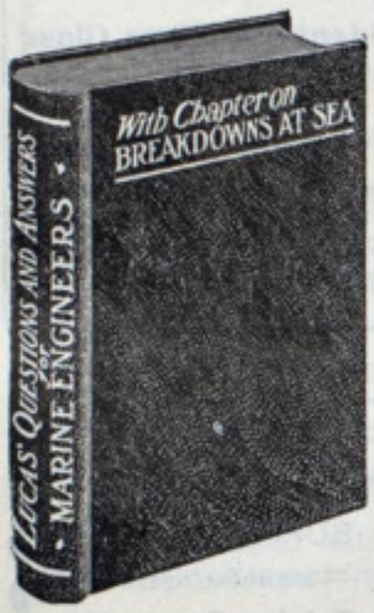

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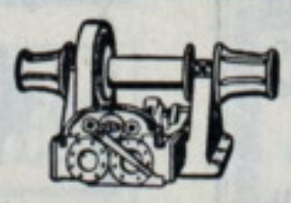

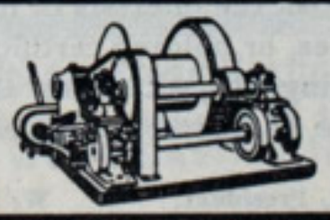

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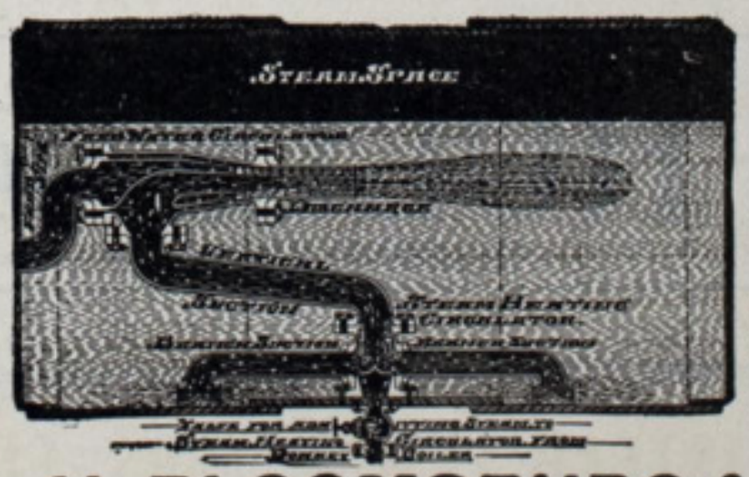

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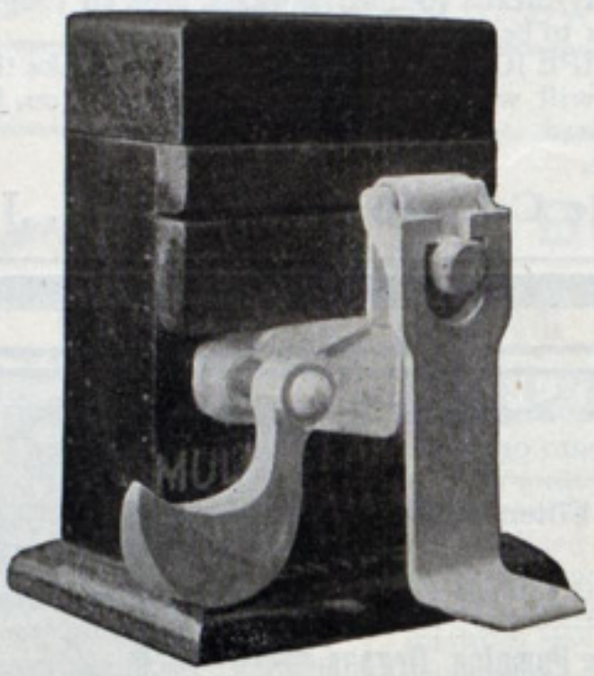

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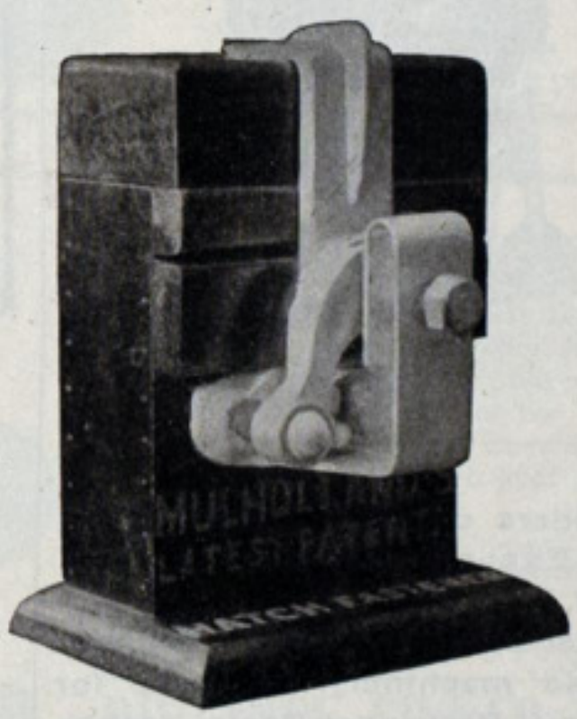

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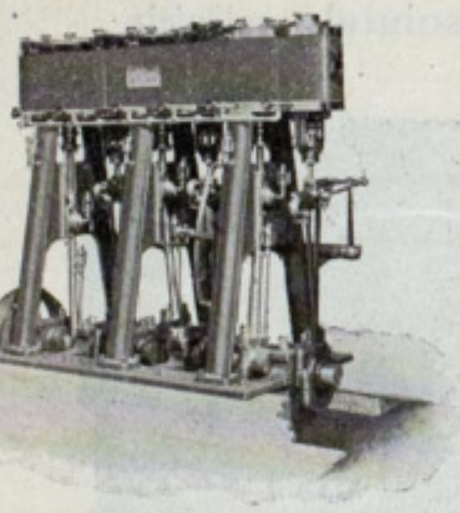

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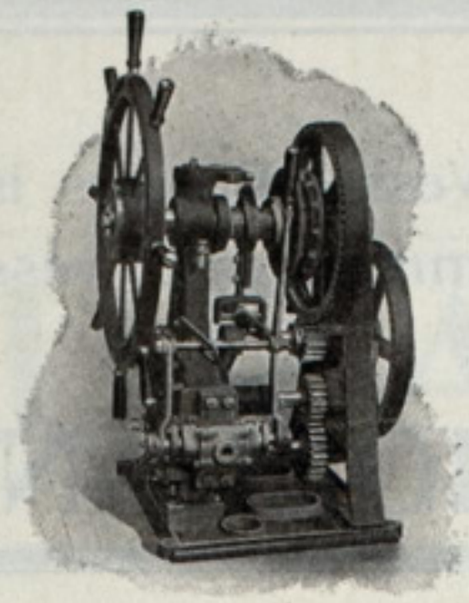

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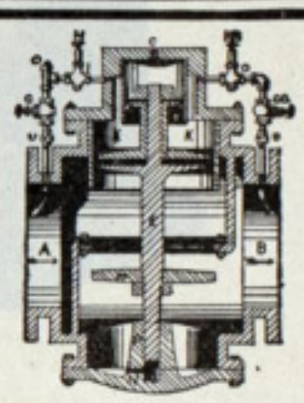

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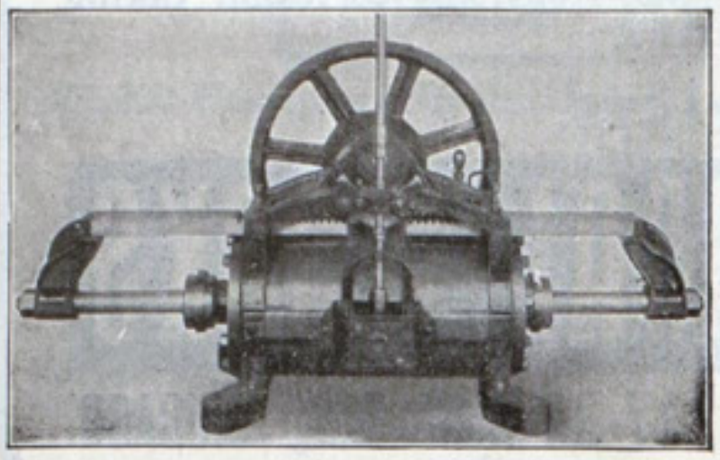

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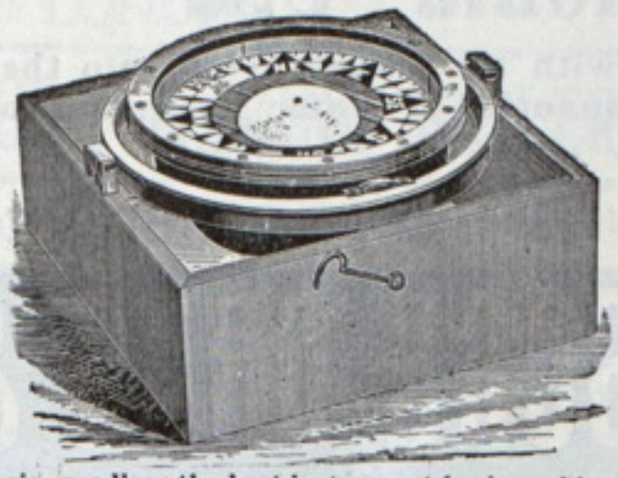

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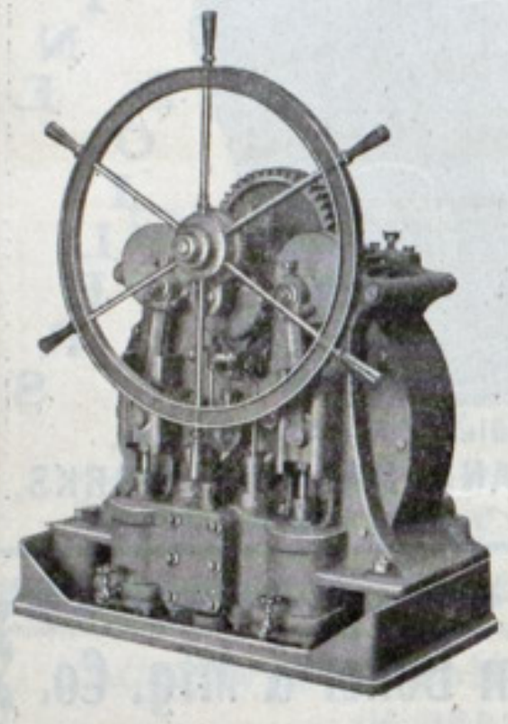

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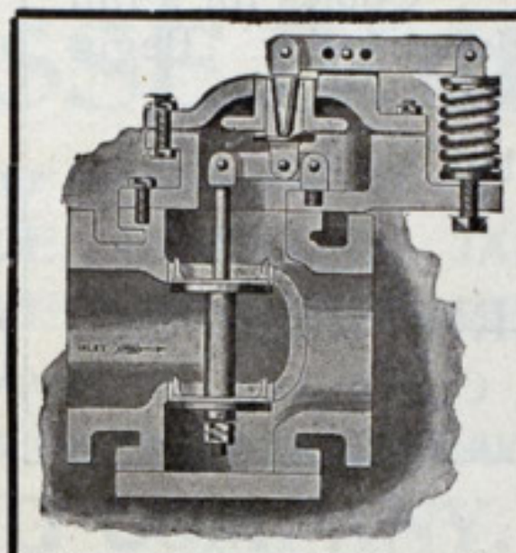

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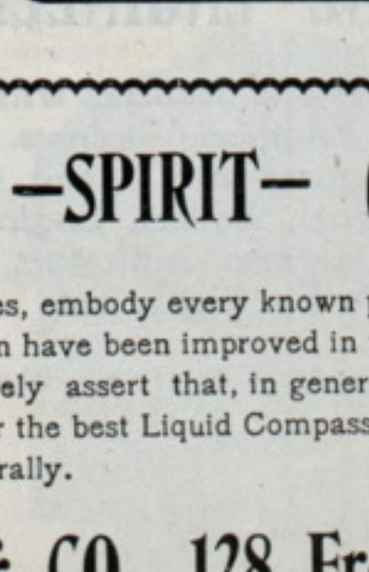

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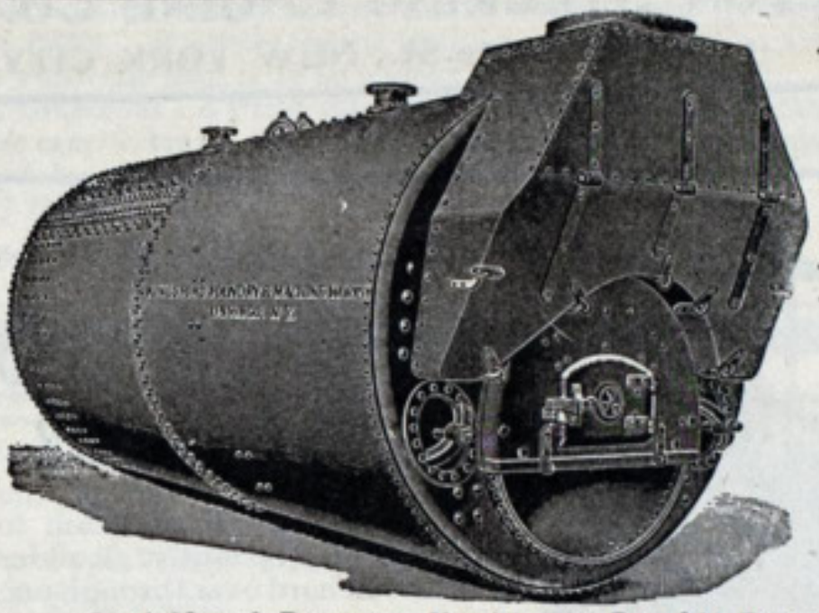

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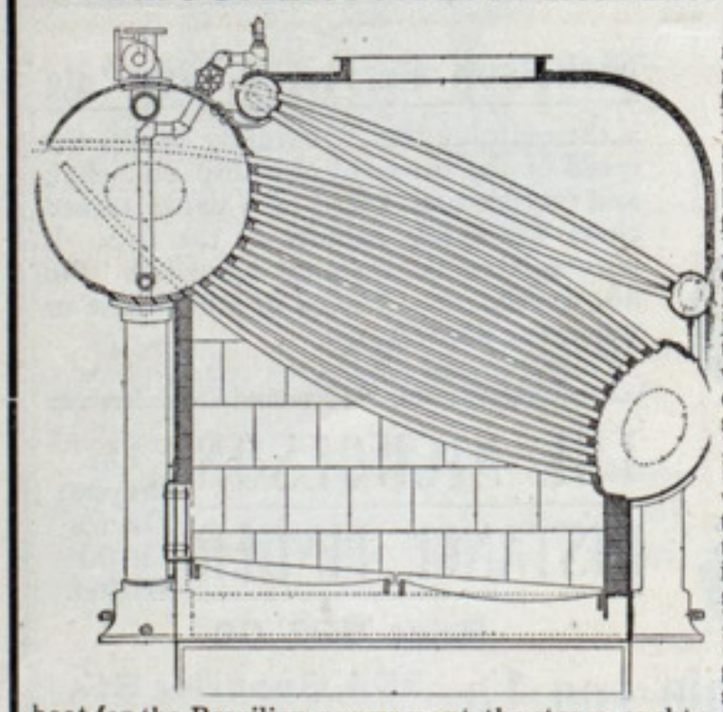

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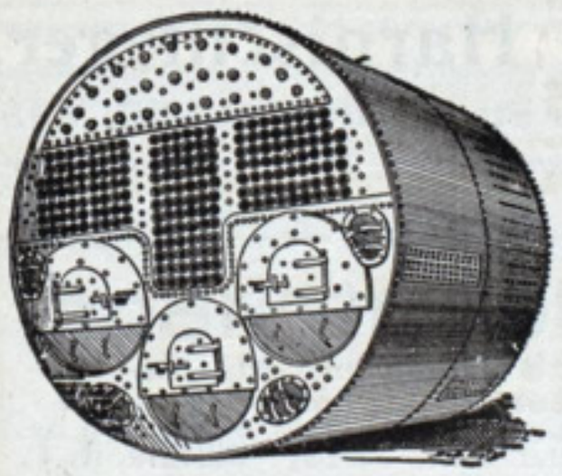

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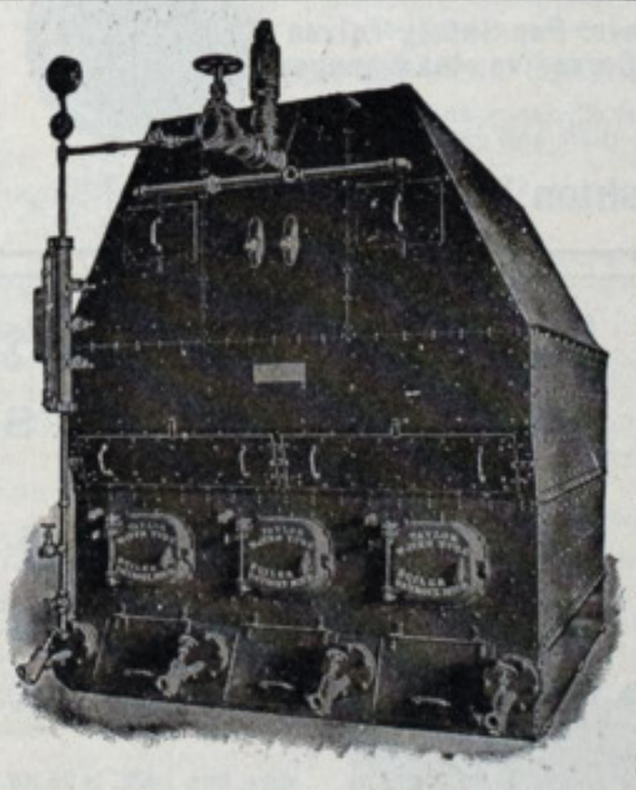

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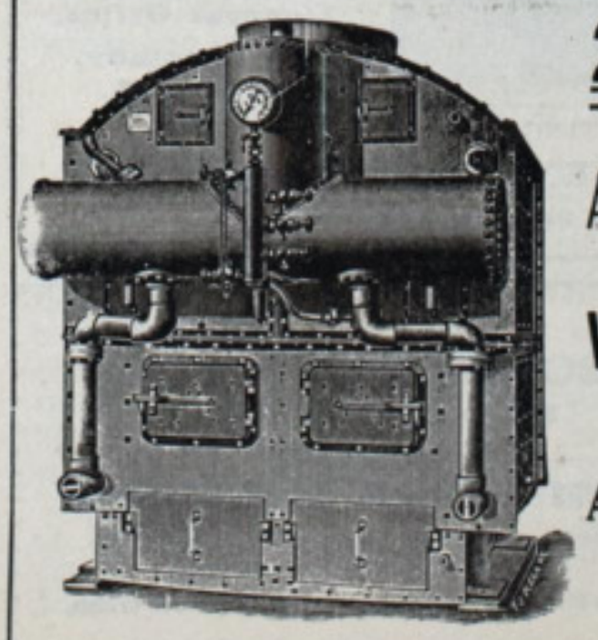

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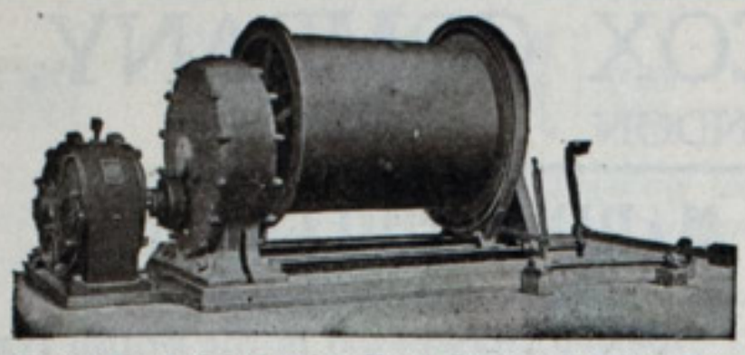

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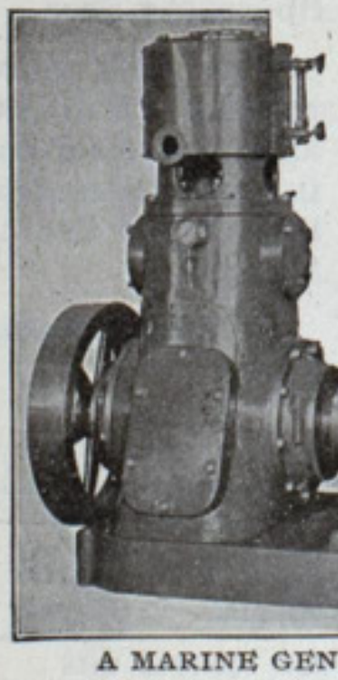

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